

Ultimate Desktop Virtualization

BEST PRACTICES GUIDE

SPONSORED BY

ATLANTIS™



Contributions by Erik Bohnhorst, Magnar Johnsen, Helge Klein, Rory Monaghan, Nick Rintalan, Ruben Spruijt, and many more.

Ultimate Desktop Virtualization

BEST PRACTICES GUIDE

Contributions by Erik Bohnhorst, Magnar Johnsen, Helge Klein, Rory Monaghan, Nick Rintalan, Ruben Spruijt, and many more.

SPONSORED BY ATLANTIS™



Table of Contents

About the Authors	5
About the Sponsors	7
Foreword	9
Chapter 1. Server Hardware.....	13
Chapter 2. Hypervisor	27
Chapter 3. Connection Broker	33
Chapter 4. Guest OS	37
Chapter 5. Remoting Protocols.....	51
Chapter 6. Networking	57
Chapter 7. GPU	63
Chapter 8. Storage	71
Chapter 9. User Environment Management.....	79
Chapter 10. Image Management.....	85
Chapter 11. Supporting Infrastructure	99
Chapter 12. Applications.....	107
Chapter 13. Various: Application Virtualization, Layering, Anti-Virus, Thin Clients	115
Chapter 14. Business and Project Lessons	123

About the Authors

Erik Bohnhorst • @ErikBoh

Performance Engineering Lead Architect, NVIDIA

Erik Bohnhorst is the Performance Lead Architect of the NVIDIA GRID Performance Engineering team where he focuses on performance and scalability related topics for remote desktop solutions. Prior to joining the performance team, Erik was a Senior GRID Solution Architect in Central Europe where he helped customers evaluate, deploy and run NVIDIA GRID. He uses his experience building real-life customer environments to build best practices for customers using GRID. Before NVIDIA, Erik worked as a VDI Pre-Sales lead for Europe, Middle East and Africa (EMEA) at HP.

Magnar Johnsen • @magnarjohnsen

EUC, Remote Graphics Specialist and Owner, Firstpoint Bergen AS

Magnar Johnsen is a EUC solution specialist, blogger, speaker, and community tool developer with +15 years experience in End User Computing. Magnar works as a consultant in Bergen in Norway. He has worked with Citrix, Microsoft and VMWare products since 1999 and with NVIDIA products since 2012. Magnar has a passion for virtualization technology, computer visualization and interaction. He has assessed, designed, implemented and supported many XenApp, VDI and virtual graphics solutions based on NVIDIA, Citrix, VMware and Microsoft technology for small to large companies in the Oil and Gas industry in Norway. Magnar shares his knowledge, tools and experience on his blog www.virtualexperience.no and speaks on several industry conferences like Citrix Synergy, Briforum and Citrix User Group.

Helge Klein • @helgeklein

Founder, Vast Limits

Helge Klein (CTP, MVP and vExpert, Splunk Revolution Award 2014) worked as an independent consultant and developer before founding Vast Limits - the uberAgent company - in 2011. Helge has worked in IT infrastructure projects for large corporations and architected the user profile management product whose successor is now available as Citrix Profile Management. Helge is the author of the popular tools Delprof2 and SetACL. He publishes a blog at <https://helgeklein.com/blog> and has presented at Citrix Synergy 2011 through 2015 and BriForum 2012, 2014 and 2015.

Rory Monaghan • @Rorymon

Technical Account Manager, Turbo.net

Rory has gained a lot of experience having spent many years working in the enterprise application and desktop space. Speaking at conferences such as BriForum, MMS, E2EVC and more, he also been quite active in the community. Rory has also collaborated on the Application Virtualization Smackdown white paper and has been awarded as a Microsoft MVP and VMware vExpert for his many contributions.

Nick Rintalan • nicholas.rintalan@citrix.com

Lead Architect, Citrix Consulting

Nick Rintalan is a Lead Architect in the Citrix Consulting organization based out of California. He has been with Citrix Consulting for the last 12 years, working on some of the largest Citrix deployments known to mankind. He has authored several well-known whitepapers such as “The Top 10 Items Found by Citrix Consulting on Assessments” and “Best Practices for XenDesktop and XenApp”. Nick has spoken at Synergy/Forum, Summit and BriForum 16 times over the years. Nick is a husband, father and enjoys golfing and hiking. Before joining Citrix, Nick briefly worked for the IBM Software Group on the WebSphere development team. Nick received Bachelors and Master’s Degrees in Computer Engineering from Tulane University in New Orleans.

Ruben Spruijt • @rspruijt

Field CTO, Atlantis Computing

Ruben Spruijt is Chief Technology Officer, Field at Atlantis Computing, responsible for driving vision, technology evangelism and thought leadership with Atlantis customers, partners and communities. Ruben is a well-regarded author, speaker, market analyst, technologist, and all-around geek. An established industry leader and luminary, he is one of only a few individuals in the world to hold three prestigious virtualization awards: Microsoft Most Valuable Professional (MVP), Citrix Technology Professional (CTP) and VMware vExpert. Ruben has presented more than 150 sessions at national and international events and founded several independent industry analysis bodies including Project Virtual Reality Check (VRC), Team Remote Graphics Experts (TeamRGE), AppVirtGURU written and co-authoring multiple disruptive ‘Smackdown’ research whitepapers.

About the Sponsors

Atlantis Computing • @atlantisSDS

Atlantis, winner of the Best of VMworld and Best of Citrix Synergy awards, offers the industry's most flexible and powerful Software-Defined Storage (SDS) platform. Atlantis delivers the performance of an all-flash array at half the cost of traditional storage. Atlantis HyperScale leverages the Atlantis patented SDS platform to deliver all-flash hyper-converged appliances that are 50 to 90 per cent lower cost than traditional storage or other hyper-converged appliances. To date, Atlantis has deployed over 120 petabytes of storage for more than 1,000 mission critical deployments and 1 million virtual workspaces, including some of the largest virtualization deployments in the world.

Intel Corporation • @intel

You may know us for our processors, but we do so much more. Through computing innovation, we push the boundaries of smart and connected technology to make amazing experiences possible for every person on Earth. From powering the latest devices and the cloud you depend on, to driving policy, diversity, sustainability, and education, we create value for our stockholders, customers, and society.

Foreword

Using a Community Mentality to Build a Better Modern Virtual Workspace

More than 17 years ago, hardly anyone knew about the technology and associated business benefits of desktop virtualization. Historically, desktop virtualization and application have not delivered on their promises - they over-promised and under-delivered. Both were too complex, expensive, and the user and admin experience wasn't good enough. Thankfully, I believe the days of Desktop Virtualization 1.0 are over, and a new era of desktop virtualization is upon us. Key technology advances are having an enormous impact on desktop virtualization and application remoting, including: Workspace as a Service, Flash, Software-Defined Storage (SDS), Hyperconverged Infrastructure (HCI) appliances, Graphical Processor Units (GPU) along with latest Remote Display protocols. These developments bring high value and are crucial in the modern virtual workspace.

Let's make the virtual workspace better, cheaper and faster than PCs and Desktop Virtualization 1.0. It will take all of us as a team to advance the industry. The community as a whole, including vendors, competitors, partners, and customers/end users need to unite to further progress into the next generation of desktop virtualization. With that in mind, I've passionately gathered information from many contributors within our space to publish the first community sourced Desktop Virtualization Best Practices Guide, 2016 edition.

Without great people, even great ideas are useless. I'm joined by more than 30 community friends who have shared over 200 of their best desktop virtualization insights and real-world practices. This guide will help you to design, build, configure and maintain successful desktop virtualization solutions.

Join the conversation and share your insights using #VDIGuide to connect with peers on the topic of desktop virtualization. Whether you are a rookie or a die-hard IT Professional who wants to know more about desktop virtualization, this guide will give you new insights to help master desktop virtualization. I encourage everyone to step out of your comfort zone and try things you haven't done before to help further the next era of desktop virtualization and to progress on a personal, business and product level.

If you want to share your best practices in the future and want to be part of this great community effort don't hesitate to contact me. Happy reading!

Ruben Spruijt • @rspruijt

Field CTO, Atlantis Computing

CHAPTER 1

Server Hardware



Andrew Morgan
@andyjmorgan

Never, ever trust performance benchmarks. We've all read the performance and sizing guidelines from Citrix, VMware and the myriad of hardware vendors out there promising 100,000 users on various types of hardware. It's crap. Perform your own benchmarks based on real users and size based off the back of this. Never trust anything you cannot quantify or validate yourself. When determining the proper sizing guidelines, you may spend more upfront; however, you're giving yourself peace of mind that you can defend the end result. In the event you have more hardware than you need, your customer will soon find a use for it and be happy with no lead times for more hardware.





Sander van der Hoek

@Sandervdhoek

Carefully select the CPU's of your hosts. Consider the number of cores versus the clock speed. Many applications still run single-threaded. Especially in engineering environments users will benefit more from high clock speeds than multiple cores.



Hugo Phan

@hugophan

Scale-out for a distributed architecture, scale-up for higher density and consolidation of desktop virtualization workloads.





Nick Rintalan

nicholas.rintalan@citrix.com

If your boxes are equipped with a HCC Haswell-EP chip, don't be afraid to enable "Cluster on Die" snooping mode in the BIOS to squeeze 5-10% more performance out of the box since all hypervisors and Windows workloads are highly NUMA optimized.



Erik Bohnhorst

@ErikBoh

A resource utilization of 100% is not a bad thing if you are still meeting your quality of service levels.





Peter Fine
@ExitTheFastLane

When sizing for fewer, and more resource dense server VM deployments (RDSH) always account for NUMA node alignment. Accounting for total logical cores in a system and ensuring that your vCPU assignments fit evenly within those cores will ensure best possible performance.





Jits Langedijk
@JRLangedijk

Understand the impact of Power Management and CPU optimization (P-states) in the BIOS of each server and it's impact in User Experience.



Magnar Johnsen
@magnarjohnsen

Always design systems that have room for peaks and growth. If your system is near max loaded from day one, it will very soon be (very) overloaded.





Jits Langedijk
@JRLangedijk

On HP ProLiant servers with the HP Power Profile option (ProLiant G6 or greater), choose maximum performance to disable power management.



Rory Monaghan
@Rorymon

Hyper-converged can help consolidate the resources you'll need and make scaling simple.





Dan Allen
@DannyRayAllen

GHz matters on servers!!! Number of cores is important, but GHz matters too! Dropping speed below 2.4 GHz can affect user experience. This is especially true with server side video and protocol rendering. H.264 cares more about GHz the # of cores.



Erik Bohnhorst
@ErikBoh

HP ProLiant Maximum Performance Profile option does not automatically enable Turbo Boost.





Andrew Morgan

@andyjmorgan

Sizing: (buy cheap, buy twice). When sizing an environment, never be tempted to size for average. Sizing for average is sizing for failure. Size your environment for peak usage and add an additional 15% contingency. When you size for average, you are immediately committing to inconsistencies in performance, guaranteeing that at peak times of the day (morning, lunch and evening) performance will be unstable. When you size for peak, you grant yourself the confidence that when things are busy performance will be within acceptable boundaries. Oversizing is far easier to deal with than undersizing. With this in mind, the contingency will also be useful should the workload be heavier than expected. If you size for average, you are buying cheap and in most cases, expect to buy again before the end of the project.





Hugo Phan

@hugophan

When sizing your desktop virtualization hosts consider the overall cost of a fewer large servers or many small servers.



Jits Langedijk

@JRLangedijk

In the BIOS settings on HP ProLiant servers, increase or set max cooling settings with NVIDIA GRID cards.





Sander van der Hoek

@Sandervdhoek

Size to accommodate peak loads. The difference between averages and peaks on network, CPU and GPU consumption can be tremendous. User will have a bad and inconsistent user-experience when peak loads cannot be accommodated.



Jits Langedijk

@JRLangedijk

In the server's system BIOS, under integrated devices, change Memory Mapped I/O above 4GB to Disabled.





Nick Rintalan

nicholas.rintalan@citrix.com

Don't be a Noob and size the pagefile as some multiple of RAM. The pagefile should be sized according to peak commit charge.



Peter Fine

@ExitTheFastLane

It's almost always about the CPU. No matter what you've heard or read, 9 times out of 10 you will exhaust CPU before you exhaust anything else.





Rob Beekmans

@robbeekmans

Problem: Performance of VDI desktops is not as expected. Expected Behaviour: VDI desktops should perform fast on a virtualization host.

Solution: Change the power management on the vSphere host for increased performance for VDI desktops: vSphere host: Configuration / Power management —> High performance. BIOS host: Power management option —> select highest power option.





Sander van der Hoek

@Sandervdhoek

If you have servers with local disks, always use raid controllers with battery backed cache. This will boost your IOPS performance dramatically for a relative small amount of extra dollars.



Hugo Phan

@hugophan

Make sure to enable Intel Hyper-Threading (HT), and verify that Virtualization Technology (VT-x) is enabled in BIOS.





Seth Knox
@seth_knox

Most good VDI configurations end up being CPU-bound. The Intel Xeon E5-2600 v4 processor family increases performance up to 27% compared to the previous v3 generation. Therefore, you may be able to increase density by up to 27% by selecting new v4 CPUs over v3 CPUs with the same user experience. As you increase density, you decrease cost proportionally. Of course, with more users per host, you will need to re-balance RAM and disk I/O requirements to ensure a good user experience at peak loads. You should also consider the implication on your failure domain particularly for smaller deployments.

<http://www.intel.com/content/www/us/en/benchmarks/server/xeon-e5-v4/xeon-e5-v4-world-record.html>



CHAPTER 2

Hypervisor



Johan van Amersfoort
@vhojan

Use vSphere Distributed Switches (vDS) if you would like to use network labels. If the vDS is properly configured, you will have to add the port groups just once on the vDS and they will be distributed to all of the hosts in the Horizon View Block.





Jason Samuel

@_JasonSamuel

NetQueue is enabled by default. It monitors the network load of all VMs and assigns queues to VMs deemed critical. This causes target devices to boot slowly when using PVS. PVS can use a ton of bandwidth when VMs are booting and this confuses NetQueue. Disabling it solves the issue: `esxcli system settings kernel set -s netNetqueueEnabled -v FALSE`





Jits Langedijk

@JRLangedijk

Before installing ESX, Hyper-V or XenServer download the latest firmware, drivers for all the servers and its under laying components.



Hugo Phan

@hugophan

Use vSphere host profiles to ensure hosts are setup and configured identically.





Daniel Feller

@djfeller

Proper XenApp VM vCPU sizing is related to the size of the NUMA. Each XenApp VM vCPU allocation should either be equal to the number of cores in each NUMA node or 1/2 the number of cores in each NUMA node but doubling the number of VMs.





Hugo Phan

@hugophan

Don't oversize and undersize the #vCPUs and amount of vRAM for your VMs.



Ruben Spruijt

@rspruijt

Before you upgrade desktop virtualization software, drivers, or guest OS agents, double check the compatibility matrix of the hypervisor, it's infrastructure components, guest OS supportability, etc.





Dan Allen
@DannyRayAllen

Do not run VDI or RDS VMs on the same hypervisor nodes as infrastructure servers. RDS and Windows 7 VMs have no business running on the same hosts supporting domain controllers, SQL, Exchange, etc. (unless you have a very small environment).



Hugo Phan
@hugophan

Setup NTP correctly for time synchronization to avoid time drifts.



CHAPTER 3

Connection Broker



Johan van Amersfoort

@vhojan

When designing pools, you need to look at the different use cases: Are my users only working within the LAN? Do I have remote workers? How many users do I have? How many applications do I need to support? Can my applications be virtualized or do they need to be in the “golden image” or deployed in another way? Are my applications I/O intensive? What kind of graphical acceleration do I need? Do I need extra GPUs? What kind of protocol will be sufficient to run my desktops on? Do I need enhanced security? Do I need connectivity to external devices like USB? What kind of business hours does my company have? etc. All these different questions could mean different settings in a pool or multiple pools. So make sure all requirements are discussed and documented.





Sandeep Pankhania

@hakabo_uk

Take into consideration the RAM size when redirecting disposable files. For example, the paging file can be placed here and not just temporary files which is especially important for (semi) persistent VMs.



Wilco van Bragt

@WilcovanBragt

Zones in XenDesktop 7.7/7.8 currently does not offer load balancing capabilities, it only controls communication traffic between VDAs, Hypervisors and Delivery Controllers.





Peter Fine
@ExitTheFastLane

Remote Desktop, Shared Hosted Sessions (RDSH) is a great place to start, until shared resources are no longer distributed equally and fewer users consume greater resources. This is where VDI comes in to play by dedicating smaller physical resource pools to more desktop VMs.



Rory Monaghan
@Rorymon

Session hosts vs Personal Desktops... why not just use a session host for those users who require less “oomph.”





Wilco van Bragt
@WilcovanBragt

When creating unattended installations via PowerShell, you can easily check if the installation was executed successfully by checking the uninstall key in the registry. For example: `$VDAUninstall=""HKLM:\SOFTWARE\Microsoft\Windows\CurrentVersion\Uninstall\{432B6E43-AAE2-4597-BBB5-C6042D5D0EA9}`

```
If ((Test-Path -path "$VDAUninstall") -ne $True)
```

```
{Write-Host "The checked uninstall key $VDAUninstall does not exist. VDA installation failed, check the logfile for details."}
```

```
-ForegroundColor Red
```

```
Exit}
```

```
else
```

```
{Write-Host "Uninstall VDA Key defined as $VDAUninstall found. VDA installation successful."} -ForegroundColor Green}
```



CHAPTER 4

Guest OS



Jason Samuel

@_JasonSamuel

Master image tuning: Filter drivers (minifilter drivers) are one of the worst ways to siphon off performance from a VM. In your Windows operating system logged in with an admin account, open up cmd and type: `fltmc filters`. What you are looking at is the filter stack. Every item listed is a filter driver that I/O has to pass through and you will take a performance hit for it. Common apps that use filter drivers are things like anti-virus, threadlockers, encryption apps, etc. Eliminate as many of these as you can. You want to minimize apps in a VDI master image that use filter drivers.





Nick Rintalan

nicholas.rintalan@citrix.com

Make sure your guest operating systems have the appropriate optimizations and AV exclusions in place. For workloads running on XA/XD, Citrix template policies such as “High Server Scalability” can be used and the latest AV exclusions can be found here.



Rory Monaghan

@Rorymon

Include core windows products in base image e.g. Visual C++ Runtimes, .NET Framework etc. to expedite and simplify patching of Virtual Desktops.





Patrick Brennan

@vPatrickB

Whether you are using Citrix, Microsoft, VMware or something else, everyone should understand the impact of performance tuning their Windows 7 and Windows 10 image for best VDI performance. Tools such as the VMware OS Optimization Tool (OSOT) or the XenDesktop Target OS Optimizer Tool are great for optimizing your guest OS.





Thomas Krampe

@thomaskrampe

The Base Image Script Framework (BIS-F) is fully developed in Powershell and helps you to seal your base image for Citrix XenApp, XenDesktop, VMware Horizon View, Microsoft RDS/VDI environments with complete automated steps from vendor best practices guides. BIS-F detect the installation of your anti-virus, system management software and some others, optimize and prepare/seal the base image and delete the unique Identifier of the listed applications to prevent duplicate/ghost entries in the management servers. Search for “Base Image Script Framework” to download the framework.





Daniel Allen
@DannyRayAllen

2 vCPUs is the minimum for VDI! Don't even think about implementing a 1 vCPU VDI desktop. You can't even buy a phone today that has less than 2 cores, why would you expect a user to run Windows on 1 core?



Patrick Brennan
@vPatrickB

If using persistent VDI, snapshots can add more IO and latency overhead and can degrade user experience. Keep snapshots to a minimum and aggregate often.





Ruben Spruijt

@rspruijt

Tuning your guest OS by disabling all of the features may sound great for IT professionals, however keep in mind that it may impact the users need to get stuff done. Before disabling all OS features just for the primary purposes of achieving greater density and performance, understand the usability impact of disabling such features as Search and ClearType.



James Rankin

@AppSenseBigot

Secure your privacy, take out the Windows 10 telemetry settings.





Daniel Allen
@DannyRayAllen

Ad blocking is a must. Web browsing can be a MAJOR drain on performance and can cut server density by 20% or more! Implement Ad Block Plus, IE Tracking Tracking, MVPS HOSTS, Proxy filters, etc.



Patrick Brennan
@vPatrickB

With XenApp/RDS set the DisablePagingExecutive registry entry to keep drivers and the kernel to remain in memory for some additional performance.





Helge Klein

@helgeklein

Does Windows really become slower over time? Yes, it does! But not because it ages in some mystical way. Windows slows down because more software is installed, and more VMs are provisioned on the same hardware, causing resources to be overcommitted. Monitor UX KPIs over time to find when and how it is happening.



Rory Monaghan

@Rorymon

Do all of your users need a full desktop experience?





Igor van der Burgh

@Igor_vd_burgh

Disable Superfetch, it tries to improve system performance over time by “learning” the typical user activity. This information is stored within the operating system, which means it is deleted upon each reboot and provides little value in a virtual desktop environment.



Patrick Brennan

@vPatrickB

Make sure you have a deep understanding of Microsoft licensing for desktop virtualization. Customers commonly forget about the correct licenses for the right use-cases. Also remember, there is no Microsoft SPLA for client OS VDI.





Ruben Spruijt
@rspruijt

Disabling indexing is considered a performance best practice; however, it is a highly appreciated feature by Office users. Understand the performance (storage) impact enabling search has on the user profile, and the impact on pooled or stateless VDI and hosted shared scenarios.



Igor van der Burgh
@Igor_vd_burgh

Reboot the virtual machine at least two times before deployment to production. This ensures that pending installations, file updates, and configurations are complete.





Theresa Miller

@24x7itconnect

Ensure that you are routinely updating the software that runs your virtual servers and/or workstations. Each version of these products offers enhancements that will typically improve system performance.



Nick Rintalan

nicholas.rintalan@citrix.com

HyperThreading should be enabled, NUMA should be taken into account, and a good rule of thumb for CPU over-subscription is somewhere in the 1.5-2x range.





Sandeep Pankhania

@hakabo_uk

Build your template machine using an automated process such as MDT to ensure the template machine can be rebuilt quickly & cleanly. Avoid manual updates where possible. Don't get tied down to the same template machine and multiple snapshots. Automation adds flexibility in the event of a failure.





Patrick Brennan

@vPatrickB

If you're seeing high CPU ready times, try adding more cores before attempting to increase socket count as socket count tends to increase the hypervisor scheduling.



Igor van der Burgh

@Igor_vd_burgh

Disable Hibernation by executing "powercfg -h off" with elevated user rights. Hibernation is not required for desktop virtualization environments. The hibernation file is unnecessary and requires storage.





Patrick Brennan

@vPatrickB

Key guest OS best-practices: When creating a new master image, start with a clean image and fully patch the guest OS. Ensure the associated virtual infrastructure tools are up to date. Disable automatic updates from tools such as Flash and Java. Try and automate building a master image if possible to save considerable time.



James Rankin

@AppSenseBigot

Give your VDI and SBC environment a performance boost by blocking animated ads and Flash banners!



CHAPTER 5

Remoting Protocols



Gerjon Kunst
@Gkunst

When using older (thin) clients and you find after migrating the Citrix environment to Windows 2012R2/XenDesktop 7.8 that the thin clients are not performing well. Try to set the ICA remoting policy's to Enable Legacy graphics mode. Although this policy is primarily used for WAN scenario's it can help squeeze the last drop of performance out of the older hardware!





Daniel Allen
@DannyRayAllen

Protocols and resolution affect scalability! Are you using VDI, RDS, GPU acceleration? You must pick the correct protocol engine and set policies properly. Even ICA has multiple engines that have varying levels of scalability impact. Picking the wrong protocol engine can double bandwidth and reduce scalability by 20% or more!



Ruben Spruijt
@rspruijt

Understand the benefits of the latest remote display protocols and the impact of hardware offloading of the encode stream. This will decrease host CPU resource consumption and increases user experience.





Sven Huisman

@SvenH

The PCoIP Session Statistics Viewer tool from Teradici is a very easy tool and presents the session information using graphs or charts originating from log files or real time data. You can then tweak the PCoIP settings and see the impact on different variables, like bandwidth, image quality, framerate, etc. The tool can be downloaded from the Teradici support website.



Patrick Brennan

@vPatrickB

Ensure display power saving mode is set to never.





Gerjon Kunst
@Gkunst

When using Windows 2008R2 RDP as your remoting protocol do not configure the optimised for WAN policy as it increases bandwidth by about 40%.



Hans Kraaijeveld
@HansKraaijeveld

When using the PCoIP sessionstatsmonitor tool to monitor bandwidth usage, be sure to set the bandwidth limit to a number making the graph visible. Since the limit is set to 900000 as default, a graph using 1500 will be hardly noticeable.





Nick Rintalan

nicholas.rintalan@citrix.com

If you are using an “older” MSFT platform such as 2008 R2, Legacy Graphics is recommended. For newer operating systems such as 2012 R2, to maximize scalability, enabling Thinwire+ instead of the default H264 codec is typically recommended.





Hans Kraaijeveld

@HansKraaijeveld

Old GDI graphics based applications can benefit very much from a higher framerate setting in the pcoip policies (> 60), but the amount of frames does increase the bandwidth needed to provide the user with the desired UX.



Sandeep Pankhania

@hakabo_uk

Few implementations require the fidelity that lossless imaging provides. Ensure build to lossless is enabled and investigate adjustments to Max/Min image quality settings, and learn how to read/troubleshoot using the PCoIP logs.



CHAPTER 6

Networking



Kyle Davies
@kdavies1988

Load balancers are a must in all environments. Do not rely on microsoft NLB or DNS round robin load balancing as these are what I class as “dumb” solutions. This is due to the way they cannot query/probe services to better forward traffic. Load balancers are key for most platforms in delivering resiliency and allow you to complete changes in production hours with no/minimal impact.





Johan van Amersfoort

@vHojan

When implementing Horizon View Pools with a number of desktops that exceeds the limit of a single 24 bit subnet, it is very wise to think about properly designing and configuring your network infrastructure for your VDI environment.



Patrick Brennan

@vPatrickB

WAN acceleration doesn't always work and can have a negative impact on bandwidth, especially since remoting protocols are typically encrypted.





Magnar Johnsen

@magnarjohnsen

The biggest problem with remote 3D applications and CAD applications is poor network condition. Consider MPLS, QoS and network optimizers when running remote protocols over WAN. Keep network latency <150ms for 3D apps.



Ruben Spruijt

@rspruijt

Buy-in from you datacenter, networking, storage, application and desktop team is critical for a succesful project.





Patrick Brennan

@vPatrickB

Network latency has an immediate impact on end user experience. Desktop virtualization performance is very sensitive to changes in latency across the WAN. Latency changes need to be measured real-time. Most management solutions poll data every 2-15 minutes averaging data over large intervals.



Johan van Amersfoort

@vHojan

Define multiple network labels per pool. Every Portgroup on the vSphere networking level gets a Network Label. When using PowerCLI, you are able to add those Network Labels to a pool.





Rich Severson

@RichSeverson

When ordering your circuits or working with your telco, ask them to tune all of the possible latency out of the network. Often the technicians are lazy, and a 100MB connection that is tuned to remove latency can be much faster than another 100MB connection. This can have dramatic impact on VDI User experience for remote users/offices.





Johan van Amersfoort

@vHojan

When thinking of broadcast network domains in a subnet of e.g. 2000 VMs, your network engineers won't be happy. So creating smaller subnets with 500 desktops/VMs at max is definitely a lot better.



Daniel Feller

@djfeller

For the best user experience, application and back-end data must reside together on a fast, low latency network.



CHAPTER 7

GPU



Jits Langedijk
@JRLangedijk

In the early days of desktop virtualization, the technology was limited to applications that required only basic graphics processing. Anything requiring significant graphics capability was nearly useless. Recent improvements in GPU virtualization, codecs, offloading, and remote display protocols have enabled the ability to use almost every application on a virtual desktop that can run on a physical PC.





Erik Bohnhorst

@ErikBoh

VDI is about performance and scalability. Don't use benchmarks that are built for local workstations in VDI scenarios. Run a POC with real users and have realistic user per host recommendations. Ask yourself if you have ever used SPECint to recommend the number of VMs in other VDI projects.



Magnar Johnsen

@magnarjohnsen

The best way to size NVIDIA GRID vGPU profiles is to monitor the users, existing workstation and applications over time for at least 3-4 weeks, and then size on peak framebuffer usage. Select a vGPU profile with larger framebuffer size.





Magnar Johnsen

@magnarjohnsen

When assessing existing GPU workloads only monitor during normal working hours to be sure that the workstation is used for work related tasks. Laptops may be used for other purposes from home (like gaming and video streaming), and may invalidate your monitored resource consumption.



Erik Bohnhorst

@ErikBoh

NVIDIA GRID Frame Rate Limiter (FRL) can be turned off for single VM benchmarks but is a single VM benchmark an important test?





Magnar Johnsen

@magnarjohnsen

Do not use benchmarks for vGPU scale testing. Benchmarks will maximize the load on the GPU and does not reflect real user work patterns which tend to be spikes with long breaks. Benchmarks results will give you feedback that the system is being under utilized. Record real user's workloads including the breaks that the user takes for simulating GPU workloads.





Magnar Johnsen

@magnarjohnsen

The type of NVIDIA GRID card you need depends on peak GPU utilization on your existing GPUs. Make sure you look at GRID card that is at least as powerful as your existing workstation GPU. Use this GPU DB to compare specs:

<https://www.techpowerup.com/gpudb/>



Erik Bohnhorst

@ErikBoh

Always use the latest firmware and drivers since someone has probably had the same issue you are having. There is a high chance that the bug has been filed, solved and the fix is available in the latest firmware/driver.





Erik Bohnhorst
@ErikBoh

The NVIDIA GRID driver is from the same family as the local Quadro drivers. Therefore the applications behave the same. In case the application vendor doesn't support a remote desktop environment and you have an issue, have a local workstation to repro the issue and submit from there.



Magnar Johnsen
@magnarjohnsen

Watch out for browser GPU utilization with VDI. They are very GPU hungry.





Magnar Johnsen

@magnarjohnsen

After implementation of GPU in a virtual environment, monitor the GPU utilization and framebuffer to verify that you are not over or under utilizing your resources. Applications tend to increase in resource consumption from version to version. User work patterns may also change.





Magnar Johnsen

@magnarjohnsen

Some CAD apps like Autocad have software cursors (crosshair) that are rendered on the server side and not on client side. This makes them very sensitive to network latency and will give poor user experience over WAN.



Erik Bohnhorst

@ErikBoh

NVIDIA GRID vGPU includes a Frame Rate Limiter (FRL) that caps the GPU to not deliver more than 60 frames per second to guarantee great performance across vGPUs.



CHAPTER 8

Storage



Ruben Spruijt
@rspruijt

Every modern PC has SSD, so why settle for less with VDI and SBC? Use solid-state technologies combined with advanced in-memory de-duplication and compression technologies for the best user experience. User experience is king in desktop virtualization.





Kyle Davies
@kdavies1988

Try not to get hung up on IOP requirements. There are solutions out there now that will provide a high level of IOPs and low latency for an acceptable price whether that be via a HCI or SDS solution or a solid state flash array. Sometimes a customer has a preference on this and our job is to discuss the options and the commercials around implementing, monitoring and managing it moving forward.



Rory Monaghan
@Rorymon

Check out Atlantis products to get the best deduplication possible.





Ruben Spruijt

@rspruijt

Running x64 version of both Microsoft Windows and Office will have substantial impact on storage IOPS and memory footprint.



Gerjon Kunst

@gkunst

When using SSD for caching do not configure the SSD raid set in Raid 5. Because of the way the RAID 5 set writes data, the SSD drives will be worn out a lot sooner.





Hugo Phan

@hugophan

When using SSD, understand the impact DWPD (Drive Writes Per Day). Which drives do you need? What is the impact for TCO/ROI? Can you use different drives when using smart de-duplication technologies?



Erik Bohnhorst

@ErikBoh

SSDs are commonly used in local workstations, so make sure to provide enough storage capacity and performance (flash based) when consolidating multiple workstation workloads onto a single storage repository.





Tobias Kreidl

@t_kreidl

For XenDesktop applications that are replicated a lot from a golden image, strongly consider using thin provisioning. By using NFS as storage, we were able to reduce our storage needs significantly. By combining this with a good software-defined storage (SDS) solution you can achieve iSCSI-like storage I/O rates and a large degree of read caching (typically around 90%!) and thereby achieve excellent response times.





Tobias Kreidl

@t_kreidl

Carefully consider dividing up your storage when creating virtual desktops. The general practice is to limit the storage to somewhere between 30 to 80 VMs on a storage volume. This is because typically, each volume has its own I/O queue established for it and overloading a single large storage device with too many VMs will eventually create a bottleneck. Monitor the wait state and service times. Mostly, they should preferably be under 20 msec.





Tobias Kreidl

@t_kreidl

With built-in on-the-fly compression/
decompression storage space can be
saved and performance increased.
A combination of these SDS features
combined with thin provisioning will make
it a 20:1 reduction in physical storage
possible and attain better I/O rates than
with conventional storage.





Gerjon Kunst
@gkunst

Never size for average. This includes never size for steady state IOPs and never size for average bandwidth. Always size for that extra 20-50% you might never need.



Hugo Phan
@hugophan

Consider local solid-state technology in servers, use distributed storage platform (SDS) for availability, performance and redundancy of data stores.



CHAPTER 9

User Environment Management



Rob Beekmans

@robbeekmans

Users working on a Windows VDI desktop have the ability to remove devices. Devices like network adapters and SCSI adapters appear as removable devices in the system tray. Users should not be able to remove system devices, and devices should not appear removable. Disable hot plug functionality for the virtual machines. vSphere client: VDI Golden Image: Options \ General \ Configuration parameter \ Add Row → Devices.hotplug = false





Helge Klein

@helgeklein

It's difficult to improve UX without solid data. What was the duration of the average logon in the past 24h? How did Group Policy processing change over time in the last quarter? Without good monitoring and analytics you are virtually blind. Don't be!



Wilco van Bragt

@WilcovanBragt

Using mandatory profiles with certificates can cause issues. Other profile solutions could be to a local profile as the default profile, or to spoof the profile.





Helge Klein

@helgeklein

Getting user state on a stateless machine quickly is difficult. Workarounds like folder redirection “solve” the problem by trading high SMB traffic during logon for constant traffic during the day. If file server performance is not consistently good, UX suffers and users get “inexplicable” app hangs.



James Rankin

@AppSenseBigot

Use application whitelisting instead of reactive anti-virus (takes a lot of setting up, but removes a big drag on your VDI sessions).





Helge Klein

@helgeklein

Everybody still uses logon scripts, and that is OK even though there are excellent UEM products available. But if you use logon scripts, make sure you know how long they take to run. And please refrain from using PowerShell during logon.



Rory Monaghan

@Rorymon

Not all UEM products are created equally. Scrutinize those products, don't just buy into the marketing jargon. Try before you buy.





James Rankin
@AppSenseBigot

Offload logon scripts until after logon has finished by using the following setting:
Computer Config | Admin Templates | System | Group Policy | Configure Logon Script Delay



Gerjon Kunst
@Gkunst

When using Microsoft User Profile Disks (UPD) as a profile management solution, remember that running UPDs on DFS shares does not work! To make this a high available solution, look for a third party solution e.g. NetApp or a VMWare Fault Tolerant file server.





Helge Klein

@helgeklein

Group Policy WMI filters have a reputation of being slow, but in many cases they are not. A GPP drive mapping to an unreachable UNC path, on the other hand, can slow logons by 5-7 seconds.



Daniel Allen

@DannyRayAllen

Plan your profile strategy properly. There are big differences between handling profiles for persistent desktops vs. non-persistent or RDS desktops. Default settings for any of the tools (Roaming, AppSense, UPM, RES, etc.) are usually insufficient. You must know your apps and data!



CHAPTER 10

Image Management



Patrick van den Born
@pvdnborn

The Citrix Provisioning Services (PVS) offline database support should be enabled when no highly available SQL Server is in place. This will reduce the impact of connection failures towards the Provisioning Services database. When SQL database is unavailable no PVS management can be done.





Patrick van den Born

@pvdnborn

Disable large send offload on Provisioning Services Server HKLM\SYSTEM\CurrentControlSet\Services\TCPIP\Parameters[DisableTaskOffload]=1 (DWORD)



Patrick van den Born

@pvdnborn

Enable large system cache on Provisioning Services Server HKLM\SYSTEM\CurrentControlSet\Control\Session Manager\Memory Management[LargeSystemCache]=1 (DWORD)





Patrick van den Born

@pvdnborn

Disable the PVS Bootmenu for Maintenance and Test target devices. HKLM\Software\Citrix\ProvisioningServices\StreamProcess [SkipBootMenu]=1 (DWORD)



Patrick van den Born

@pvdnborn

Disable large send offload on Citrix Provisioning Services Target device HKLM\SYSTEM\CurrentControlSet\Services\TCPIP\Parameters[DisableTaskOffload]=1 (DWORD)





Patrick van den Born

@pvdnborn

Create a domain service account for Citrix Provisioning Services. This account will be used to access the Provisioning Services database and for running the SOAP and Stream Services. Add this account to the local administrators group of all the provisioning services.



Patrick van den Born

@pvdnborn

Do not limit the Local Concurrent I/O by configuring PVS Server setting “Local concurrent I/O limit (transactions)” = 0





Patrick van den Born

@pvdnborn

Configure enough memory for caching the vDisk into the Citrix PVS Server Memory.
Use this formula (Memory of OS + OS Cache)
+ (Active vDisks * Avg. data read from vDisk) =
Total MEM PVS Server



Patrick van den Born

@pvdnborn

Do not limit the Remote Concurrent I/O by
configuring PVS Server setting “Remote
concurrent I/O limit (transactions)” = 0





Patrick van den Born

@pvdnborn

Do not mix Provisioning Services Console and Server versions. I.E. Using The Citrix Provisioning Services 6.1 Console for managing a Citrix Provisioning Services 7.6 Server.



Patrick van den Born

@pvdnborn

In case of a separated Citrix PVS streaming VLAN, disable “Register this connection’s addresses in DNS” for the streaming NIC.





Patrick van den Born

@pvdnborn

Isolate streaming network traffic by creating a separate Citrix PVS Streaming VLAN. Each PVS Server should have at least two network cards. One connected to the internal LAN and one connected to the PVS VLAN.



Patrick van den Born

@pvdnborn

Only enable Internet Protocol Version 4 on the Citrix PVS Streaming NIC, disable all other items like “Client for Microsoft Networks.”





Patrick van den Born

@pvdnborn

When using a SMB share for vDisk placement, use at least Windows 2012 for the Citrix Provisioning Server and File server to support SMBv3.



Patrick van den Born

@pvdnborn

When using a SMB share for vDisk placement, disable opportunistic locking on the file server.





Patrick van den Born

@pvdnborn

When using TFTP boot, use a load balancer for load balancing of the TFTP traffic.



Patrick van den Born

@pvdnborn

Use a Dynamic VHDX file as the vDisk image. This is the best practice from Citrix.





Nick Rintalan

@nicholas.rintalan@citrix.com

The new Citrix PVS “RCwOtD - Write Cache with OverFlow to Disk” introduced in 7.1.3+ is a game-changer and should be implemented whenever possible. Whereas a previous Win10 workload may have generated 10-20 average IOPS, with the new wC method that same workload may only generate 1-2 IOPS.



Patrick van den Born

@pvdnborn

Install Citrix Provisioning Services Target device software as last. The PVS drivers will get the best priority on the target device.





Nick Rintalan

@nicholas.rintalan@citrix.com

Don't forget to tweak the default memory buffers for Citrix PVS RCwOtD. If you're looking for a starting point, 512 MB – 1 GB and 2 – 4GB are good guidelines for XD and XA workloads, respectively.



Patrick van den Born

@pvdnborn

To guarantee maximum performance of PVS Server, virus scan exclusions need to be set properly for the Citrix Provisioning Services.





Patrick van den Born

@pvdnborn

When the Citrix Provisioning Server is virtualized, enable Receive Side Scaling on the Streaming NIC.



Patrick van den Born

@pvdnborn

Since BIOS is getting old and UEFI is new, use UEFI as the default boot method.





Nick Rintalan

nicholas.rintalan@citrix.com

PVS should almost always be virtualized and ~1000 targets per box is a good rule of thumb. Just don't forget to tweak your ports and threads as you scale up (hint: 8 vCPUs is a good starting point and more ports are better than threads per port!).



Ruben Spruijt

@rspruijt

Image-based deployment is deployment, NOT management.





Patrick van den Born

@pvdnborn

The Citrix Provisioning Services database needs to be redundant by using Microsoft SQL Database mirroring or Microsoft SQL AlwaysOn clustering. This will reduce the impact of disruption or malfunctioning of one Microsoft SQL Servers.



Patrick van den Born

@pvdnborn

Use a local drive for the vDisk store, this is faster than storing a vDisk store on a SMB share.



CHAPTER 11

Supporting Infrastructure



Carl Webster

@carlwebster

AD does not need Reverse DNS Lookup Zones but many virtualization products do. Among them Citrix Web Interface, StoreFront, NetScaler, Kerberos and XenApp, XenDesktop and Director. For VMware, both vSphere and vCenter work best when Reverse DNS Zones are configured.





Rob Beekmans

@robbeekmans

Client devices will report there is a man in the middle attack when thumbprints of web servers or brokers are not equal. Does it always happen? No, but it happens. Making sure both thumbprints are equal solves this.



Carl Webster

@carlwebster

Make sure for Microsoft DNS that “Aging and Scavenging” is configured properly.





Carl Webster

@carlwebster

Make sure your AD “Sites and Services” have all subnets defined and linked to the correct sites.



Carl Webster

@carlwebster

Make sure there are no manual connection objects created to connect domain controllers in different sites.





Ruben Spruijt

@rspruijt

Don't rely on performance counters to identify outages alone because this will likely result in a lot of false positives. Use the right tools that give insights of users on the systems that are actually impacted.



Carl Webster

@carlwebster

Monitor `c:\windows\debug\netlogon.log` on all domain controllers for missing subnets.





Carl Webster

@carlwebster

For the majority of AD environments, make sure all domain controllers are configured as Global Catalog servers.



Peter Fine

@ExitTheFastLane

A SQL database represents the crown jewels and is at the heart of every VDI solution. Take all precautions within reason to protect the database: physical, virtual, and data redundancy.





Carl Webster

@carlwebster

Make sure the domain controller that holds the PDCe FSMO role is a very stable and reliable server and that it is configured properly. Also make sure that it is configured properly for use as a authoritative time server.



Carl Webster

@carlwebster

Make sure the DNS IP settings on the network interface for each domain controller are configured properly.





Wilco van Bragt

@WilcovanBragt

Still many people don't know that every Windows computer in AD also has a machine password in AD, which is changed regularly (by default every 30 days). This can cause domain trust relationship issues when using snapshots. To "solve" this, the password change can be disabled via a GPO), but it's a bit less secure.





Hans Kraaijeveld

@HansKraaijeveld

When composing linked clone pools, make sure your dhcp scope is large enough and has its lease time set to a short amount of time.



Carl Webster

@carlwebster

If using both Microsoft DHCP and DNS, make sure the DNS aging periods are configured for the DHCP lease duration and that DNS update credential is used.



CHAPTER 12

Applications



Hans Kraaijeveld
@HansKraaijeveld

Update your Teradici zero client firmware when updating View. Otherwise security hardening from View 6.2.1 and beyond makes them incompatible due to the fact that Cipher suites including Diffie-Hellman and RC4 have been disabled, as well as SSLv3.





Ruben Spruijt

@rspruijt

Upgrading to Microsoft Office 2013 consumes up to 20% more VDI capacity in comparison to Office 2007 and Office 2010.



Gerjon Kunst

@Gkunst

We have had several customers where Office 2013 would perform badly in a session where as the rest of the session would be lightning fast. Disabling hardware acceleration would fix that issue in almost all cases: <https://support.microsoft.com/en-us/kb/2768648>





Gerjon Kunst

@Gkunst

In other cases where Office 2013 would use a high amount of CPU, deinstalling this hotfix would resolve this issue: <https://support.microsoft.com/en-us/kb/3114729>



Hans Kraaijeveld

@HansKraaijeveld

Make sure the application landscape is ready for a non-persistent desktop. Many applications can use network based license servers, but this often requires a change in licensing model.





Patrick Brennan

@vPatrickB

Desktop virtualization and unified communications have always been a challenge for applications like Skype for Business (Lync). Be sure you understand the challenges associated with these apps such as the hairpinning effect, etc. Make sure you use the VDI plugins like the HDX Realtime optimization pack to solve these challenges.





Daniel Allen
@DannyRayAllen

Choose your thin clients wisely! Not all thin clients are created equal. An HDX logo/features does NOT mean all HDX applications are supported. Know what features you need and whether the thin client supports them (H.264 rendering, client side Lync, client side multi-cast, HDX 3D Pro, etc.)





Wilco van Bragt

@WilcovanBragt

Disabling printer and USB client mapping for security is useless if the user has the possibility to use online e-mail (like Gmail) or file transfer sites (wetransfer, dropbox and so on).



Aaron Parker

@stealthpuppy

Applications drive success - rationalize your application estate to determine best use cases.





Daniel Allen
@DannyRayAllen

Outlook 2013 or higher is a must for RDS and non-persistent VDI. OST files and cached mode have always been a pain point, but MS made major improvements to OST with 2013 and does support OST redirection to file servers. With Outlook 2010 and earlier it sucks.





Magnar Johnsen

@magnarjohnsen

When virtualizing engineering applications you've got one shot. They will either love it or hate it. Do it right the first time.



Patrick Brennan

@vPatrickB

Understanding your applications is critical to the success of your project. How and where does the application write its' data? Is it supported for VDI or RDSH/SBC? If so, is it supported and what is the impact when you run it in a persistent, non-persistent, or shared environment?



CHAPTER 13

Various: Application Virtualization, Layering, Anti-Virus, Thin Clients



Ruben Spruijt
@rspruijt

Most anti-virus solutions were designed for typical desktop and laptop environments, not for (stateless) desktop virtualization environments. The performance impact is considerable. Test the impact before rolling out an anti-virus solution in a desktop virtualization environment.





Gerjon Kunst
@Gkunst

NITCtxPatcher is a patchmanager for Citrix XenApp and XenDesktop 7.x. This tool can check your installed hotfixes on your environment, and based on that, show you what hotfixes you are missing and download and install them for you.



Rory Monaghan
@Rorymon

Use tools like ThinIO and Lakeside Systrack to pinpoint your potential bottlenecks before beginning.





Patrick Brennan

@vPatrickB

Choose the right thinclient for the business and technical requirements. Understand the differences in flexibility, price, supportability, extendability of Linux and Windows based Zero/ThinClients. Consider re-using PCs or even the use of small form factor devices like android, etc.





Patrick Brennan

@vPatrickB

Disable scanning on reads, enabling on writes and scan the golden (master) image before you deploying. Understand which anti-virus excludions are needed for your applications, OS, VDI, and SBC solution. Spread the use of scheduled scans if these are necessary.



Gerjon Kunst

@Gkunst

Bpanalyzer.com: this tool can run your Citrix installation against best practices contributed by the community. And it can configure them for you if you wish!





Igor van der Burgh

@Igor_vd_burgh

Limit anti-virus definition updates to only the Citrix PVS master target device or update target devices. Also avoid scanning the vDisk write cache file and streaming disk IO that makes up the operating system for a given target.



Ruben Spruijt

@rspruijt

Anti-virus off-loading architectures make a big difference from a storage IO point of view, but not always from a concurrent user perspective.





Kyle Davies
@kdavies1988

NOT ALL CLIENTS ARE CREATED EQUAL:
When selecting a thin client, whether it be for VMware Horizon, Citrix, etc., it is crucial to understand what is required of the endpoint. Many architects and consultant follow the “ANY” rule for devices, but not all endpoints will support the same redirection, driver capabilities and audio/video offloading capabilities. This has been improved over the years but some vendors are still heavily reliant on Windows based endpoints for full functionality.





Sandeep Pankhania

@hakabo_uk

Get an in-guest monitoring solution (eg, Systrack) to help aid in troubleshooting user problems both current and historical. The hypervisor level tools don't normally offer the level of granularity required.



Hans Kraaijeveld

@HansKraaijeveld

Opt for agentless anti-malware when hosting 50 VMs or more per host, this will increase your scaling capabilities.





Rory Monaghan
@Rorymon

Use layering, app virtualization and/or containers together. Minimize the number of non-MS third party apps in image. Use app virtualization or containerization on as many apps as possible for the most flexible and dynamic delivery possible. Layer anything deemed complex for app virtualization.



Ruben Spruijt
@rspruijt

Perform an anti-virus pre-scan of the master image before it is deployed.



CHAPTER 14

Business and Project Lessons



Kyle Davies
@kdavies1988

When sizing your virtual workspace, discuss how the environment will be used in a disaster recovery scenario. Do you need 100% failover of users? Is degraded performance acceptable? What are the RPO/RTO times? Are the datacentres active/active or active/passive? How will users access in DR, will you use GSLB or a separate URL/rely on DNS changes? etc.





Helge Klein

@helgeklein

When sizing a new VDI environment, it is tempting to use averages, and seems like the logical thing to do. But it also guarantees a bad user experience. Instead, sizing calculations should be based on peak average usage. Ignore individual short-term peaks, but prepare for periods of high load.



Johan van Amersfoort

@vHojan

No user is the same, no company is the same, no infrastructure is the same. So indeed, desktop virtualization implementations aren't the same either.





Sander van der Hoek

@Sandervdhoek

Recognize the value of the tester. Your VDI project will not be successful if you do not involve business users enough to thoroughly test the new platform. Embrace your testers and let them know you appreciate them. Make sure you give them something in return for their testing effort.



Ruben Spruijt

@rspruijt

The modern workspace is the engine of the digital workplace for today's workforce.





Johan van Amersfoort

@vHojan

Imagine building a house without creating a building plan. Indeed, the project is guaranteed to fail.



Ruben Spruijt

@rspruijt

End user experience means that productivity, application response time, and flexibility are critical to the success of the VDI project.





Mangar Johnsen

@magnarjohnsen

Never underestimate the power of visiting the end users. I've learned so much from listening to and watching how people are using their IT systems.



Ruben Spruijt

@rspruijt

Don't start your desktop virtualization design until you understand the use case, constraints and opportunities.





Andrew Morgan

@andyjmorgan

When enrolling a user to a new solution, mobile, virtual desktop or otherwise, it's imperative that the user is sold the benefits of the solution from the get go. Where possible, training, hand holding, and enrollment should be performed by a positive, friendly, and pro-active member of your staff. This will allow end users to understand the benefits, and how to get the most of of the solution from the beginning. While this may take time, the benefits are invaluable as it gives users comfort and encourages them to use the new solution while selling the benefits to other users when asked. Selling solutions to users is more important than the benefits of the solution itself. If a user adopts the product willingly, your job is greatly simplified. This will give you more lenience should issues arrive from the beginning. Users will feel valued and help the others see the benefits of the project and new solution.





Sander van der Hoek

@Sandervdhoek

To measure is to know. If you cannot measure it, you cannot improve it. Do not assume average IOPS, CPU, MEM etc. There are many good assessment, load test and monitoring tools available that will help you to make the performance more predictive. Use these tools!



Magnar Johnsen

@magnarjohnsen

Spending more time in the planning and assessment phase of a project saves a lot of time in the total project timeline.





Rory Monaghan

@Rorymon

The stack you use will likely be dictated by politics rather than quality of the products. Identify the gaps in the stack and budget accordingly to remedy.



Ruben Spruijt

@rspruijt

End user experience is KING in every desktop virtualization project. Make sure you listen and understand their requirements, manage the expectations before you even think about technology and products.





Andrew Morgan

@andyjmorgan

When initial deployment begins of any project, administrators are always tempted to startup the entire environment and allow users to trickle into the solution gradually. This is an incredibly stupid thing to do for the following reason. Take XenApp as an example, if a user has access to 50-100% of a XenApp servers resources in the first days, you are setting performance expectations of your champion users that will only get slower as time goes by. This is setting yourself up for failure from the start. Only turn on enough of the environment to serve your current user base and scale new hardware AS IT IS REQUIRED. This will set expectations from the start and ensure reliable performance throughout the deployment.





Aaron Parker
@stealthpuppy

One size does not fit all - VDI/SBC can be a flexible solution for desktop delivery, but don't give them a virtual desktop just because you can - give them a virtual desktop because it's the right fit.



Ruben Spruijt
@rspruijt

Desktop virtualization is NOT a management solution, it can only simplify management.





Hans Kraaijeveld

@HansKraaijeveld

Make use of the pstools suite when troubleshooting VM performance remotely, especially pslist, pskill, and psexec. These can often get you real time information you would otherwise not be able to see.



Jits Langedijk

@JRLangedijk

When it comes to refreshing your current VDI environment, GPU, Flash, and SDS are key considerations.





Erik Bohnhorst

@ErikBoh

The value of remote desktop solutions is different to every organization. Listen to their business problems and translate them to what remote desktop/app solutions can deliver.



Sven Huisman

@SvenH

You can't improve what you don't measure.





Kyle Davies
@kdavies1988

Security should not be an after thought. Ensure your environment is covered from day one, otherwise you will become vulnerable. At the moment, users may be using physical devices on a corporate LAN, separated with security boundaries (firewalls/VLANs etc.) to the data center. Once the users utilize desktop virtualization solutions they will be located within the data center straight away! You should look to implement a designed network architecture for security control, implementation of ACI or SDN technologies like NSX, anti-virus and malware protection, patching policies, and trusted ownership solutions like AppSense application manager, etc.





Patrick Brennan

@vPatrickB

Desktop virtualization projects touch every part of the technology stack, including: server, hypervisor, guest OS, applications, network, storage, security, and overall infrastructure. If one of those systems fail, it can take down the entire environment. Make sure your team includes representation from every part of the IT organization to ensure every potential component is working together to stay highly available and running smooth.





Ruben Spruijt

@rspruijt

Know your business consumers, which are your end users. Understand what they need, showcase the (PoC) environment. Which apps do they use and how do they use them? How are their desktops configured? Do they have the freedom to change their environment? Manage their expectations and communicate accordingly.



Jits Langedijk

@JRLangedijk

If you don't have time to do it right, when will you have time to do it over?





Andrew Wood

@gilwood_cs

It is cost effective to automate repetitive tasks; it is expensive and complicated to automate everything. Know what you are automating before you automate it.



Ruben Spruijt

@rspruijt

Stop relying on end users as monitors of the desktop virtualization environment. End users' subjectivity becomes IT's nightmare. Without actionable data on performance, IT is in reactive mode chasing trouble tickets.





Kyle Davies
@kdavies1988

A lot of people say that desktop virtualization is complex. I personally believe that this isn't true. The virtualisation element is the easy bit. Understanding your reason to move to virtual workspaces, the applications you use, and your user requirements are the time consuming and challenging elements. This is true though for any physical deployment where a transformative solution is being implemented!





Ruben Spruijt

@rspruijt

IT becomes the orchestrator and aggregator of IT service. IT as a broker is easier said than done. IT has the reputation as the bottleneck to agility - not the gateway to it.



Sinisa Sokolic

@sinisasokolic

The initial effort for automating key components pays off in the long term.





Sandeep Pankhania

@hakabo_uk

Embrace the power of Powershell, it's the future of Windows based administration. Pick a real task that you'd normally use the GUI for and invest the time learning how to script it. The added time taken is an investment in your future.



Ruben Spruijt

@rspruijt

Price is only ever an issue in the absence of value.





Andrew Morgan

@andyjmorgan

Start by defining the bare minimum functionality and security with the key stake holders and document the requirements. Build a project team by selecting a champion from the security, network, data/desktop and help desk roles/teams and assign them dedicated time with daily meetings for the duration of this project. Encourage this team to work amongst themselves and deploy the first phase of the offering. Where possible, plan classroom training for your users where you enroll their devices and walk them through the work flows for the functionality you are offering. Regularly open the floor to questions and feedback, particularly during the early phases. Document this feedback, it's invaluable. With this approach, you stand a far better chance of succeeding than falling on your face.





Jits Langedijk
@JRLangedijk

KISS - Keep It Simple Stupid whenever possible.



Ruben Spruijt
@rspruijt

If you do what you love you'll never work a day in your life.



Ultimate Desktop Virtualization

BEST PRACTICES GUIDE

Follow the conversation using #VDIGuide

SPONSORED BY ATLANTIS™



Ultimate Desktop Virtualization

BEST PRACTICES GUIDE

In the industry's first community-sourced desktop virtualization guide, we've brought together over 30 community pros to share their best practices. This guide will help you design, build, configure, and maintain successful desktop virtualization solutions.

Don't miss this chance to get over 200 real-world examples of how other IT pros are implementing and leveraging the benefits of desktop virtualization.

This best practice guide includes a range of topics, including:

- Server Hardware
- Hypervisor
- Connection Broker
- Guest OS
- Remoting Protocols
- Networking
- GPU Storage
- User Environment Management
- Image Management
- Supporting Infrastructure
- Applications
- Various (App Virt, Layering, Anti-Virus, Thin Clients)
- Business and Project Lessons

Follow the conversation using [#VDIGuide](#)

ISBN 978-0-692-69905-8 \$9.99
5 0 9 9 9 >



9 780692 699058

SPONSORED BY

ATLANTIS™

