

Improvement of VDI user- experience in Healthcare

How testing reduces the amount of user complaints and simultaneously cuts the costs within your virtual desktop environment

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Executive summary

VDI continues to gain popularity within the Healthcare sector. More and more desktops migrate to the cloud. While IT-organizations within healthcare roll out specialized EMR-applications, among them Epic, Cerner and McKesson, expectations of end-users in relation to desktop experiences on each device at any moment, continue to grow. IT departments within healthcare must rise to the challenge of delivering outstanding services, while reducing the complexity and costs associated with infrastructure. For end users, IT departments and businesses many issues boil down to performance.

In complex environments within healthcare, with many users sharing centralized servers, storage, software and even GPU's, the IT department faces added difficulty offering the users the same performance they grew accustomed to on their fat clients and notebooks. When centralizing—whether the environment uses Citrix XenDesktop, Citrix XenApp, VMware Horizon View and/or Microsoft Remote Desktop Services (RDS) for application and desktop virtualization— IT departments quickly run into resource limitations leading to degraded performance. Often the root of performance problems can be averted by performance testing.

Storage innovations over the past few years have certainly eased the problems associated with sharing resources. Yet the introduction of so many storage solutions has added complexity, not only in IT environments, but also in the wider market: There are myriad options and configurations now available. As a result, nearly every IT environment is unique and some combinations of resources and technologies have never been tested before.

Performance testing is crucial in new desktop virtualization projects, pilots, Proofs of Concept and production phases. Because of the countless unique technology and service options to consider when undertaking a new VDI project, capacity planning and load testing the environment are essential to moving confidently into production.

Testing should always be performed at scale with synthetic users, before real users are live and in production. The project and pilot phase due diligence will help ensure a smooth transition to production: the last thing an IT department needs is a poor end user experience in the first few weeks because systems are stressed.

Once in production, successful centralized desktop environments are managed and maintained with a disciplined approach to release and change management that includes (automated) performance tests. Software application updates should be tested for their impact on each IT department's specific environment: without this testing, at some point business will suffer the consequences of downtime.

In each phase of your desktop virtualization deployment, the IT department should strive for three areas of insight:

- Predict: What is the performance impact of necessary updates and upgrades?
- Validate: How many users can my infrastructure support before performance suffers?
- Manage: How do I stay ahead of support tickets from end users and understand performance from the end users' perspective?

The indirect value of testing makes the direct capital investments (time plus software) needed to execute testing, sometimes hard to justify. The goal of this white paper is to help all involved to better understand, and to be able to explain, the business case behind virtual desktop infrastructure testing.

1. Who should read this paper?

This whitepaper is intended for:

- Enterprise IT directors, decision makers and executives in healthcare, responsible for total cost of ownership of specialized health applications, virtualized desktop environments, security, and quality of service to end users.
- Consultants, professional services organizations and systems integrators supporting healthcare organizations in building, deploying and maintaining their virtualized desktop environment.
- Service providers, including DaaS providers, concerned with fulfilling Service Level Agreements to healthcare organizations.
- Systems administrations and virtualization engineers in healthcare, responsible for researching, evaluating, recommending and implementing tools for virtualized desktop environments.

2. Performance: the crucial factor

IT departments within the healthcare sector would like to offer their virtual desktop users the same rich desktop experience they were accustomed to in their fat client environments. End users expect a great experience, and performance—perceived and actual—is tied to the overall experience. Because of the centralized processing of functionality and the central storage of data, the speed, capacity and configuration of the centralized servers are a key success factor in delivering a great experience in virtualized desktop environments.

Meanwhile, poor desktop performance is the number one end user complaint in virtual desktop environments. Desktop performance issues have a negative impact on productivity within the IT department and the larger business. Consequences of unpredictable performance include:

- Lost productivity
- Frustration and acrimonious working relationships between users and IT
- Support tickets that cannot be closed because the source of the problem can't be identified
- System failure resulting from a software update can cost the IT department weeks of time

The impact of not testing (lost productivity, time to repair and restart, and system failure) can add up to hundreds of thousands of dollars.

A structured approach towards testing in every phase from project to production, combined with the best tools available in the industry today, will help organizations enjoy the benefits of top-performing centralized desktop infrastructures at the lowest cost possible.

3. Testing in transformation projects

During the planning stage of critical IT projects in the healthcare sector, such as the implementation of Electronic Patient/Healthcare Records (EPR or EMR) the main value of testing is to aid in building the best possible infrastructures at the lowest cost possible.

There are many choices to consider in both software (which broker, hypervisor, antivirus solution) and hardware (which servers, CPU, storage solution). Hardware and software vendors' lab-based claims need to be checked against your real-world environment. To increase objectivity, benchmarking various configurations in your IT environment will yield insight into the optimal setup. Follow these two steps:

3.1 Start with reading the vendor whitepapers and reference architectures.

A best practice when embarking on a new hosted desktop project or expanding an existing one is to review the relevant test reports, design validations and reference architectures that vendors publish. Hardware and software vendors, including software-driven storage vendors, base their performance references on the industry standards set and maintained by Login VSI. The simulated user workloads are shared across vendors so it makes it easy to compare the claims of different vendors.

By introducing apples-to-apples comparison, Login VSI has added coherence to the hosted desktop industry, especially important when the market is complex and fast-changing. Vendor white papers based on Login VSI test data are available for free at: www.loginvsi.com/resources/benchmark-reports.

3.2 Test different infrastructure options in your own environment.

While vendor reference architectures give insight into the capabilities of the different software and hardware options in clean lab environments, actual performance and scalability will depend on your real-world production environment where other factors are at play.

Testing with a production load reveals the potential flaws in a proposed infrastructure (whether the plans are from a vendor, consultant, or internal IT department) and helps in choosing the best performing and the most cost-effective solution. Using Login VSI for load testing is an easy and cost-effective way to reveal and validate the true capacity of the proposed or existing infrastructure.

CASE STUDY

Hospital Cherry Health needed to enhance the interoperability and performance of the software for a new SBC-implementation.

Instead of painfully estimating variables such as the number of servers, processors, memory and capacity, Cherry Health relied on Login VSI because our software was easy to use and provided industry standard end-user experience tests. This enabled the IT team to better predict, validate and manage the performance of their new virtualized desktop environment. Using Login VSI for benchmarking, sizing and scaling, allowed them to predict that, by migrating to new hardware, significantly less servers were needed to support the same number of virtual desktops.

4. Testing in production: maintain great performance and avoid failure

In healthcare, offering a good user experience to end-users, can literally save lives. Performance testing of production environments helps the IT department maintain great, predictable performance and avoid infrastructure slowdowns and failures. Integrating testing as a standard and ongoing business practice into the virtual desktop product life cycle is key to avoiding the costs of business and IT disruptions.

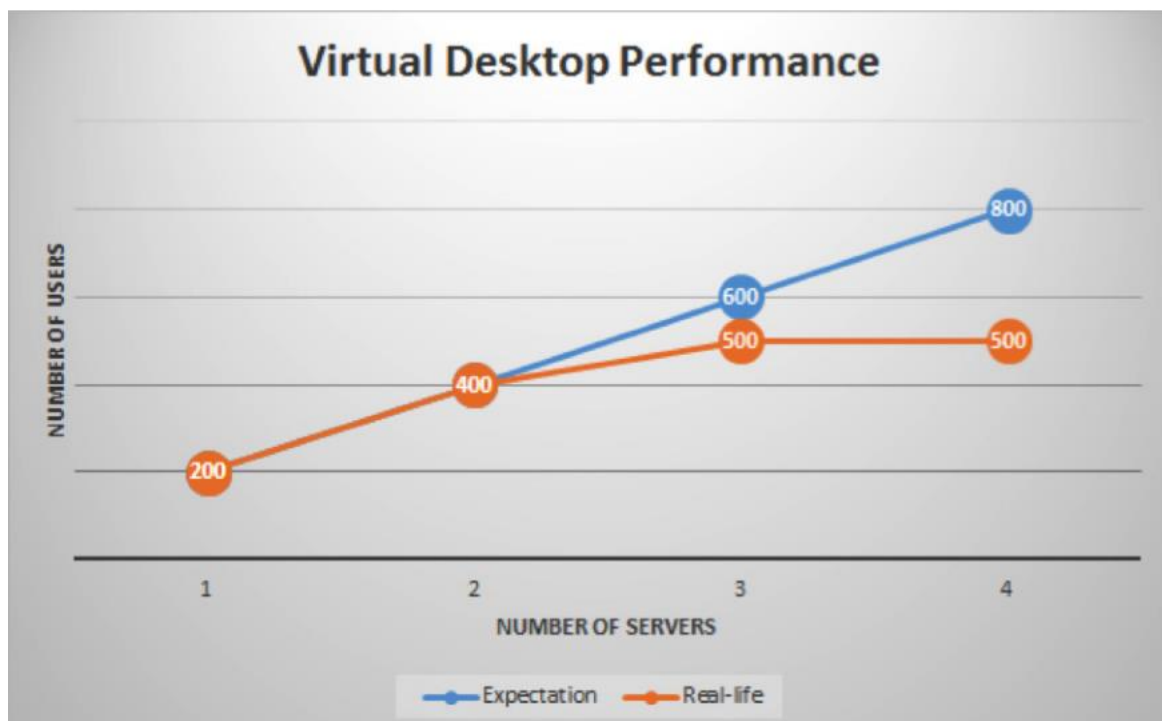
Healthcare organizations that have experienced the damage from slowdowns or failures seek a way to prevent such problems. Organizations that have not yet experienced the business impact of performance issues need to make sure performance continues to be a non-issue. With software updates required so frequently (think of Windows 10 builds, security patches, and application updates), performance problems can hurt your crucial business processes at any time, if tests are not performed.

Every update, upgrade or other change to your environment can have a negative impact on end user productivity. This is obviously true for larger but also for smaller production environments (of 50 to 100 desktop users). The savvy IT director does not rely on vendors to test software: each update will have a unique impact depending on the unique environment.

5. Testing does not scale linearly

You will want to perform your Proofs of Concept with total number the intended users. The main pitfall in POC tests is to assume that performance scales linearly with the number of servers. Data from limited tests cannot be accurately extrapolated to the full user base. There are many examples of hosted desktop infrastructure tests sample of real users that performed well initially, but later experienced fundamental performance and capacity issues when production was scaled out.

A complete environment responds fundamentally differently than when testing a subset of users. The most obvious reason for this is the shared systems, especially shared storage. Performance will typically scale linearly for the first several servers. However, scaling quickly becomes nonlinear. The graph below illustrates this point. The blue line shows the expected number of desktops on the total number of servers. While performance of the desktops is fine at 400 users, simply adding an extra server at 500 users won't satisfy our needs.



PICTURE 1: EXPECTATION VS REAL-LIFE VAN VIRTUAL DESKTOP PERFORMANCE

In addition to storage, the other commonly shared components in complex environments may include broker/load balancers, monitoring, power, networking, cooling, anti-virus, backend databases, fileservers, and application servers or application virtualization techniques.

The only way an IT department can truly validate that all shared resources are working correctly together is by testing at full scale. These are some of the questions you might have that testing at capacity can help answer:

- Is my environment stable and performing at the desired capacity?
- Are the backend systems handling the load?
- Can my environment handle logon-storms?
- What happens if one of my datacenters fails?
- What happens if one of my servers (or racks) fails?

For example, an enterprise's storage device was misconfigured to only use a limited amount of CPU. Initial tests with few users indicated that there wasn't a problem. But as soon as the tests were ramped up to 400 or 500 users, the environment came to a complete halt. After identifying and resolving the issue, the IT department could host the desired number of users on the environment and move to pilot phase.

The best practice recommendation is to start performance tests with just one machine to make sure it works and is getting the best performance. Following this initial test, start increasing the test size to full-scale. The same goes for environments that are already in production. When expanding or altering your production environment, it is important to scale your test to the true number of users so you know exactly what level of performance to expect.

CASE STUDY

Insufficient testing puts 25 percent of workforces out of business.

A European fundraiser for healthcare research relies on a Server Based Computing environment based on Citrix XenApp to provide a productive desktop environment for 600 telephone fundraisers. The intended update to the PVS image was tested by a subset of 60 real users. This small-scale test with real users did not reveal any performance problems so the update was rolled out into production. The next day, 150 of the 600 staff were unable to work for several days causing a serious loss of revenue. As a result, upper management mandated a testing process to be fully integrated into the business continuity processes. All infrastructure changes with a potential impact on desktop users are now tested at full scale with Login VSI before getting implemented. Additionally, the non-profit performs monthly stress tests to stay on top of performance.

6.20% performance degradation upgrading from Microsoft Office 2010 to Office 2013

Laboratory testing conducted by the independent group Project Virtual Reality Check reveals that the upgrade from Microsoft Office 2010 to Office 2013 results in a 20 percent reduction in performance for hosted desktop environments. Most upgrades in software applications add features and functionality. With more resources being consumed with richer applications, the tradeoff is either seen in a degradation of performance or the need for more infrastructure. Therefore, as a matter of standard procedure, all software upgrades should be tested in advance to measure the impact. If the level of performance degradation is unacceptable, it will be necessary to extra hardware resources before pushing the update into production.

CASE STUDY

Large government agency challenges SLA and avoids disaster rollout to 5,000 users.

A large Dutch government agency was preparing to roll out a hosted desktop environment for 15,000 users. They negotiated a fixed price deal, including all hardware needed, with a large service provider. The first tests were performed with a sub-set of 100 users, and the results were erroneously assumed to be scalable to the entire user base. When the first block of hardware for 5,000 users was implemented based on sizing estimations, the customer decided to validate the infrastructure before initiating roll-out to the production end users. The scalability tests with Login VSI showed that the infrastructure installed could only support 3,500 users. The numbers were used to negotiate a larger environment with the service provider, and a great disaster was prevented.

7. Testing is no longer time-consuming or expensive

Testing hosted desktop environments used to involve a very tangible capital investment in expensive test software suites and specialized test hardware. The traditional test process involved weeks or sometimes months to install the test software. This was on top of the time needed to build and perform the actual tests. Professional testing engineers were needed to install the test environment, to build and run the tests, and to read and understand the performance test results.

Even if some organizations recognized the risks of not testing, the costs of traditional testing were still so high that many organizations opted to wing it. This approach sometimes had disastrous results.

CASE STUDY

Fortune 100 health care company avoids disaster rollout to 2,000 users.

A US-based Fortune 100 health insurance company used Login VSI to safely migrate to a new storage platform to better support its hosted desktop environment.

Conventional tests by vendors of the separate components (storage, server, hypervisor) all showed good performance. But tests of the complete infrastructure (all servers instead of a single server) with Login VSI hinted at possible problems.

Further research showed a significant error in the storage configuration that would have caused serious performance problems when this system was rolled out to all 2000 planned users.

8. Login VSI makes VDI testing easy and cost effective

Login VSI simulates the common workloads of real-life users and does not require any additional infrastructure beyond a test bed. Login VSI was designed by experienced specialists who saw the need for testing solutions that were easy to implement and easy to use. The product is based on decades of combined experience in hosted desktops in real-world customer environments. Because Login VSI tests can be deployed very quickly, the software allows you to profit from the benefits of testing in every phase of a desktop virtualization project.

Easy installation

Where traditional test environments used to take up to four weeks to be installed and started, Login VSI can be installed and ready for use in less than four hours.

Quick and easy test creation and execution

The industry standard workloads make starting a test easy and quick. The flow-based interface makes test building and execution easy for non-test professionals.

Reliable and useful test results

VSI_{max} is an industry-accepted term that indicates the maximum number of virtual users that can be served by the tested infrastructure with an acceptable performance. Because it is a common measurement, it is possible to make scalability comparisons between different tests.

Investment pays for itself

Where traditional testing environments were very costly to buy and to maintain, Login VSI makes testing affordable for all stages of a hosted desktop environment and for any size environment.

By using Login VSI as part of a disciplined approach to testing, organizations can build more flexible user environments while increasing productivity and reducing costs.

9. Performance goes beyond the project phase

PHASE	PROJECT	PRODUCTION
BUSINESS QUESTIONS	Which VDI product? How much hardware?	Can we still grow? What happens if... How do changes impact performance?
TEST OBJECTIVES	Benchmarking Proof of Concept Capacity Planning & Production Readiness	Load Testing and Stress Testing HW/SW Change & Impact Analysis
TEST BENEFITS	Best fit product Optimal resources	Future ready Protect performance
TEST VALUE	Make the right decisions Reduce risk and optimize spend	Stay out of trouble Optimize & protect performance

PICTURE 2: PERFORMANCE TESTED, IN AND AFTER THE PROJECT PHASE

In the project phase

Benchmarking different infrastructure options in the project phase helps you:

- Compare and select the best performing products (and avoid technical problems).
- Compare and select the most cost-effective products (which helps to save costs).
- Make choices based on objective tests (rather than speculation).
- Compare old and new environments (which helps to build sound business cases).

Capacity planning and production readiness in the project phase help you:

- Validate sizing estimations and calculations (and avoid over- or under-spending).
- Make a budget based on facts (and avoid financial disappointments later).
- Test the entire infrastructure before going production (and avoid performance issues).

In the production phase

Load testing and stress testing in the production phase helps you:

- Determine your systems maximum user load (which helps to support planned growth).
- Prepare for non-standard peak-usage scenarios (which helps to prepare for unplanned loads).
- Get an objective baseline of performance (and reduce expensive production problems).

Testing the impact of every change in your VDI production environment helps you:

- Avoid unexpected performance problems (and avoid problems instead of fixing them).
- Test potential improvements upfront (and improve your infrastructure without risk).
- Safeguard the health of your environment (and therefore reduce problems in production).

10. About Login VSI

Login VSI is the industry standard in synthetic load testing and active monitoring for VDI and DaaS environments (infrastructure and applications). Login VSI is used by enterprises with centralized desktop environments and/or business critical applications running in VDI, and all major IT vendors that offer solutions for VDI. All organizations where key processes need a reliable performance, such as healthcare organizations or financial institutions, benefit greatly from Login VSI software.

The Login VSI Enterprise Edition offers a unique combination of synthetic load-testing and pro-active monitoring capabilities, allowing enterprises to design, build and maintain VDI environments (both infrastructure and applications) that can provide, and safeguard, the optimal end-user experience.

The Login VSI load-testing solution generates a large number of synthetic users to test and protect the performance and scalability of your new and existing VDI, SBC and DaaS deployments.

The Login PI active monitoring solution uses a single synthetic user running 24/7, to safeguard performance and availability of your virtual desktop infrastructure and applications.

11. When to use Login VSI?

For benchmarking and Proofs of Concept:

- 100% vendor independent and 100% objective
- Out-of-the box standard workloads make product comparisons easy
- Login VSI is used by all leading virtualized desktop technology vendors

For capacity planning and production readiness:

- Easy to use through out-of-the-box workloads
- Precise through easy workload customization (when needed)
- Used for sizing by Systems Engineers at Cisco, HP, Citrix, VMware and other IT vendors

For load testing, stress testing and determining baselines:

- Different standard workloads are available for different scenarios
- Login VSI allows for (close to) simultaneous logons or workloads
- Workload content and phasing can be adapted to reflect real-life usage

For change impact prediction:

- Ease-of-use allows for testing each intended change before implementation
- Large end-user organizations use Login VSI as a part of their DTAP process
- Subscription licenses provide value for money and lifetime performance protection

Benefits of testing for the organization	Benefits of testing for the IT manager
Fewer frustrated desktop users	Maintained management support
Reduced costly business interruptions	More successful virtualized desktop projects
Better ROI on virtualized desktop projects	Happy end users, fewer trouble tickets
Reduced risk to the business	More responsible administration

Appendices

Appendix A: Recognizing the risks of non-testing

When considering your virtualized desktop environment, whether you are in proof of concept, project or production stage, the following are some questions to consider:

1. Why invest in benchmarking different infrastructure options?
 - When evaluating hardware and software relating to your virtualized desktop hardware and software, how will the claims of vendors translate to your unique environment?
 - What is the cost/benefit of purchasing Login VSI for benchmarking so you optimize your infrastructure investment, predict performance and accurately scale?
 - What is the risk to end user productivity and to the business if a software upgrade goes wrong?
2. Why invest in capacity planning and production readiness?
 - How do you test how much servers and storage you need to maintain a good user experience?
 - Can your current environment support more users coming on board?
 - What is the financial impact of buying too much capacity?
 - What is the business impact of not buying enough capacity?
 - What is the greatest risk of not having enough capacity?
3. Why invest in load testing, stress testing and establishing a baseline?
 - How often do usage peaks occur?
 - Are they predictable (like logon-storms)?
 - Are you 100% sure your new system is powerful enough to survive usage peaks?
 - As your company grows, can your virtualized desktop environment take on more users?
 - Do you know the maximum capacity of your system?
 - What would be the biggest benefit of knowing the maximum load of your current system?
4. Why invest in change impact prediction?
 - How important is performance to end users?
 - Can you identify the source or replicate end user performance problems?
 - Do you fear performance loss after installing a new version, update, upgrade, or patch?
 - What would be the costs of an upgrade that goes wrong in terms of time and money?

Appendix B: Best practices to avoid performance problems

1. Read the relevant test reports, validated designs and reference architectures that infrastructure vendors publish based on tests using Login VSI.
2. Test all infrastructure options proposed by different vendors in your own business environment.
3. Size and scale hosted desktop infrastructures based on test data before going production.
4. Test all intended infrastructure changes before implementation for possible performance impact.
5. Test with the real production number of users. Subsets not always reveal all potential problems.
6. Test the entire infrastructure. Testing components or single servers will not reveal all problems.
7. Test to validate SLAs of service providers.

