



# **VMware Horizon 7.4 on HPE SimpliVity 2600**

Delivers an excellent end-user experience in virtual desktop environments



# Contents

Introduction.....3

    Results summary.....3

    Solution preview .....3

HPE SimpliVity overview.....3

Test environment configuration.....4

    Hardware configuration.....5

    Horizon 7 virtual desktop VM configuration.....6

    Datastore configuration.....6

    Performance testing procedures.....6

    Login VSI.....6

Test results.....7

    700 Knowledge Worker users.....7

    1000 Knowledge Worker users.....8

Analysis of test results from Login VSI.....8

    About the Login VSI performance numbers.....8

VSI conclusion and additional notes.....9

Summary.....9

    About Login VSI .....9

Resources and additional links .....10



## Introduction

Client virtualization provides customers with a more consistent end-user experience and excellent operational benefits, including security, protection of company data, centralized control and management, plus increases flexibility and accessibility for end-user client platforms. While these advantages are obvious and attractive to many companies, there are challenges to overcome in a cost-effective manner that ensure an excellent end-user experience.

HPE SimpliVity hyperconverged infrastructure solves many of these challenges by eliminating the redundant IOPS that plague client virtualization environments, eliminating silos of data management, and utilizing built-in data protection and mobility.

This white paper documents the results of HPE led testing to provide evidence of these efficiency gains on VMware Horizon® 7 virtual desktops. All tests were performed with Horizon 7 Linked Clone deployed virtual machines, and the tests leveraged Login VSI ([loginvsi.com](http://loginvsi.com)), the industry-standard load testing solution for virtualized desktop environments. These tests offer insight into the latest performance results of VMware Horizon 7.4 on HPE OmniStack software version 3.7.5.

## Results summary

The performance testing illustrates the ability of the HPE SimpliVity 2600 to deliver an excellent end-user experience in client virtualization deployments as the environment scales. Highlights include:

1. Performance at scale: Consistent, very low average latency as measured by Login VSI.
2. With 4X HPE SimpliVity XL170r nodes, 700 Knowledge Worker users were run on virtual desktops deployed by Horizon 7.
3. With 6X HPE SimpliVity XL170r nodes, 1000 Knowledge Worker users were run on virtual desktops deployed by Horizon 7.

## Solution preview

Client virtualization initiatives have gained a reputation for being costly, time consuming, difficult to architect, and, worst of all, prone to failure due to poor user experience. When deployed on HPE SimpliVity, many of the common administrative pain points are alleviated, while giving business owners confidence that their end users will experience superior desktop performance. HPE SimpliVity delivers client virtualization without compromise, with a strong focus on end-user experience, operational efficiency and economics, and enterprise-level data protection and resiliency.

The following performance tests were conducted to document the performance characteristics of VMware Horizon 7.4 virtual desktops running on HPE SimpliVity hyperconverged infrastructure. These results are a sample and are not intended to offer a comprehensive overview of all client virtualization use cases that HPE SimpliVity addresses. Contact HPE sales to discuss how HPE SimpliVity addresses other client virtualization use cases.

## HPE SimpliVity overview

HPE SimpliVity is a hyperconverged infrastructure solution built for the enterprise. With the release of the HPE SimpliVity 2600, customers now have the choice of running HPE SimpliVity hyperconverged infrastructure on either the industry-leading HPE ProLiant DL380 Gen10 2U servers or HPE Apollo r2600 platforms. Within the HPE SimpliVity 2600 platform, customers also have the choice of leveraging either HPE SimpliVity XL170r (4N2U) or HPE SimpliVity XL190r (2N2U)-based nodes. Clustering multiple HPE SimpliVity powered hyperconverged infrastructure nodes forms a shared resource pool and delivers high availability, mobility, and efficient scaling of performance and capacity.

HPE SimpliVity assimilates all IT infrastructure and services below the hypervisor into a single, scalable x86 building block. Two or more instances of HPE SimpliVity-powered hyperconverged building blocks deployed together form a federation—delivering a massively scalable pool of shared resources.

HPE SimpliVity offers differentiation from other converged infrastructure in its HPE SimpliVity Data Virtualization Platform, which enables a single shared resource pool across multiple sites and provides highly efficient data storage and mobility. The HPE SimpliVity Data Virtualization Platform provides global VM-centric management and mobility, built-in resiliency and data protection, and always-on inline data deduplication and compression.



# HPE SimpliVity—the powerhouse in hyperconvergence

A powerful hyperconverged platform with best-in-class data services

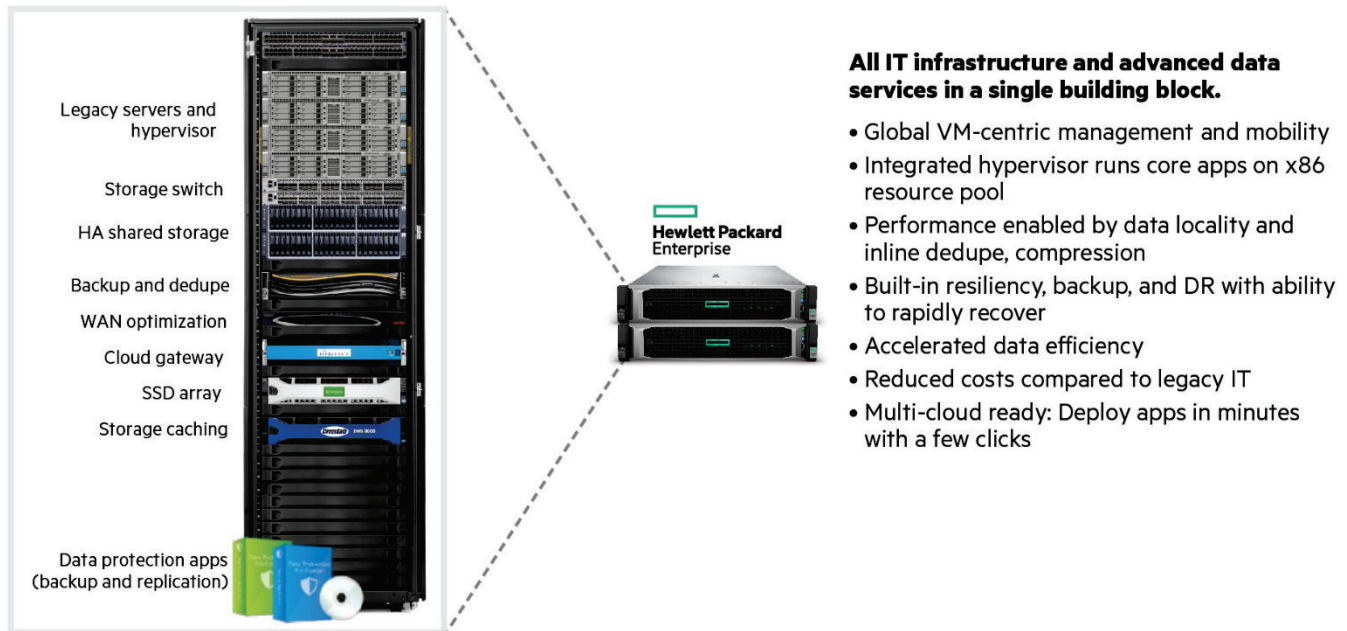


Figure 1. HPE SimpliVity overview

## Test environment configuration

The configuration chosen for these tests was a four-node HPE SimpliVity XL170r hyperconverged infrastructure host deployment to support 700 users and six of the same nodes to support 1000 users. The four-node environment was configured as a 4+0 HPE OmniStack Federation. Similarly, the six-node environment was deployed as a 6+0. Each host has two 22-core Intel® Xeon® Gold 6152 CPUs and 464 GB of usable memory.

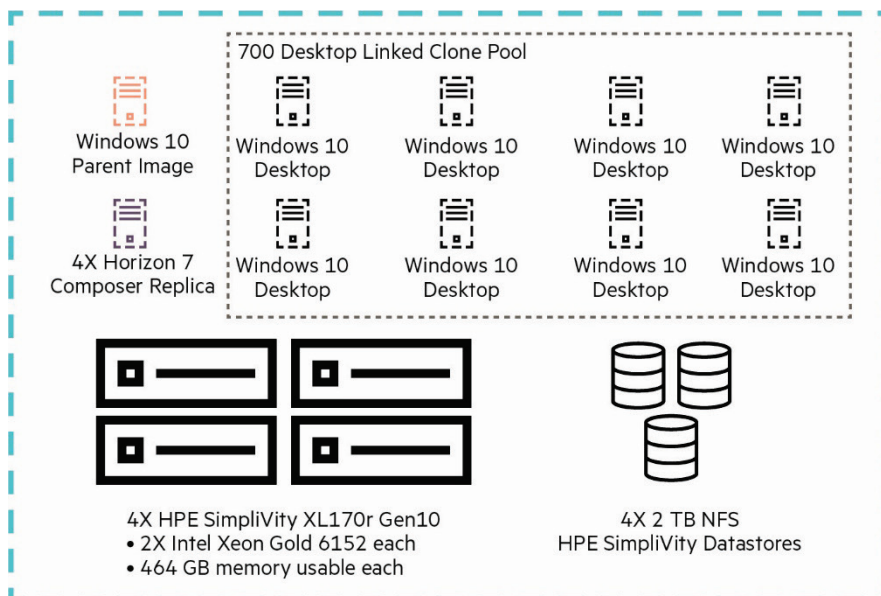


Figure 2. HPE SimpliVity 2600 logical design—700 users

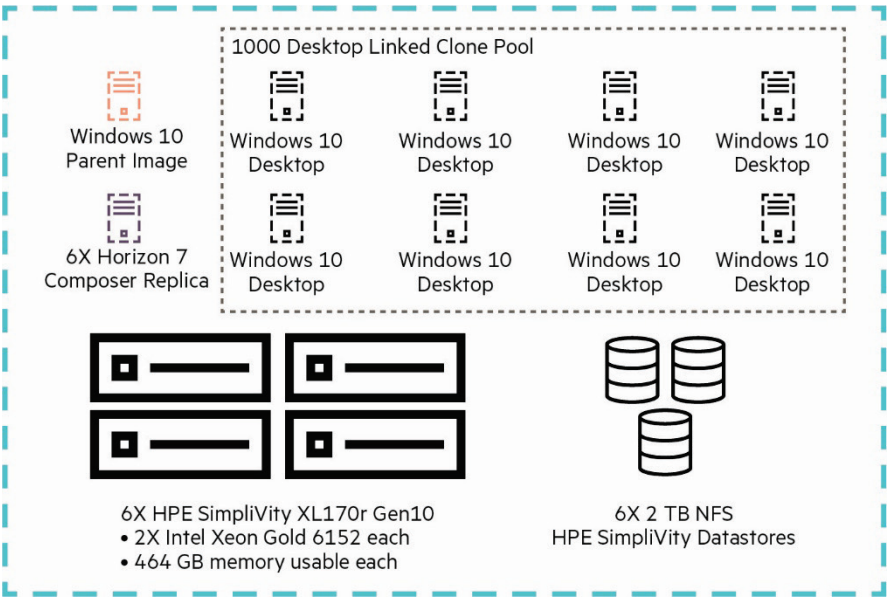


Figure 3. HPE SimpliVity 2600 logical design—1000 users

For these tests, we used VMware Horizon 7 linked clone-based virtual desktops running Windows® 10 as our operating system. As shown by [Project VRC](#), this newer generation desktop operating system is much more resource intensive as compared to its predecessor, Windows 7. In that same vein, we used Microsoft® Office 2016 versus previous benchmarks published with Office 2010. As shown in a [head-to-head comparison by VirtualCentric](#), Office 2016 is also more CPU intensive than 2010. As such, these results cannot easily be compared with previous benchmarks.

Hardware configuration

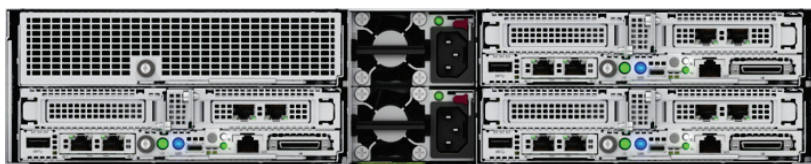
Table 1. Hardware configuration

| Attribute                                       | Specification                           |
|---|---|
| HPE SimpliVity 2600 node type                   | HPE SimpliVity 170 Gen10                |
| Number of HPE SimpliVity nodes (700 users)      | 4                                       |
| Number of HPE SimpliVity nodes (1000 users)     | 6                                       |
| Number of HPE Apollo r2600 chassis (700 users)  | 2 (2 nodes per chassis)                 |
| Number of HPE Apollo r2600 chassis (1000 users) | 2 (3 nodes per chassis)                 |
| HPE SimpliVity 2600 per node specifications     |   |
| Model   | HPE SimpliVity 170 Gen10                |
| CPU   | 2X Intel Xeon Gold 6152 (22 cores each) |
| Memory  | 512 GB (464 GB usable)                  |
| Disk  | 6X 1.92 TB SSD                          |



Figure 4. HPE SimpliVity 2600 chassis—front view





**Figure 5.** HPE SimpliVity 2600 chassis—rear view with 3X HPE SimpliVity 170 Gen10 nodes installed

## Horizon 7 virtual desktop VM configuration

**Table 2.** Horizon 7 VM configuration

| Attribute                   | Specification                  |
|-----------------------------|--------------------------------|
| Operating system            | Windows 10 LTSB 64-bit         |
| Virtual hardware            | VM virtual hardware version 13 |
| VMware® tools               | 10.1.7                         |
| Number of vCPUs             | 2                              |
| Memory                      | 2304 MB                        |
| Virtual disk—VMDK           | 40 GB                          |
| NTFS cluster alignment      | 8 KB                           |
| SCSI controller             | VMware Paravirtual             |
| Virtual floppy drive        | Removed                        |
| Virtual CD/DVD drive        | Removed                        |
| NIC vendor and model        | VMXNET3                        |
| Number of ports/NIC x speed | 1X 10 Gigabit Ethernet         |
| OS page file                | 1.5 GB starting and max        |

## Datastore configuration

For the 700-user test, 4 x 2 TB NFS datastores were created and presented to the 4+0 cluster. Similarly, 6 x 2 TB NFS datastores were used in the 6+0 cluster to support 1000 users. Horizon 7 Linked Clone pool configuration is set to deploy a Horizon 7 Composer Replica to each datastore, which the HPE SimpliVity Data Virtualization Platform ensures are instantiated one per host, ensuring balance of I/O load across hosts.

## Performance testing procedures

In each case, balance of VMs across hosts in the VMware vSphere® cluster and balance of storage across HPE SimpliVity 2600 nodes was ensured before starting a Login VSI run. During each run, vSphere DRS was set to Partially Automated mode to ensure VMs would not vMotion to another host within the vSphere cluster.

## Login VSI

Login VSI has standard workloads for use in benchmark testing, including the Knowledge Worker workload, which was used in this set of tests. This standard workload is defined as follows by Login VSI, per user:

**Table 3.** Knowledge Worker

| Parameter | Setting |
|-----------|---------|
| Apps open | 5–9     |
| IOPS      | 8.5     |
| Memory    | 1.5 GB  |
| CPU       | 2 vCPU  |



**Table 4.** Applications**Setting**

Microsoft Word 2016

Microsoft Excel 2016

Microsoft Outlook 2016

Microsoft PowerPoint 2016

Internet Explorer 11

Mind Map

Flash Player

Doro PDF Printer

Photo Viewer

All performance testing documented utilized the Login VSI ([loginvsi.com](http://loginvsi.com)) benchmarking tool. Login VSI is the industry-standard load testing solution for centralized virtualized desktop environments. When used for benchmarking, the software measures the total response time of several specific user operations being performed within a desktop workload in a scripted loop. The baseline is the measurement of the response time of specific operations performed in the desktop workload, which is measured in milliseconds (ms).

There are two values in particular that are important to note: **VSIBase** and **VSImax**.

- **VSIBase:** A score reflecting the response time of specific operations performed in the desktop workload when there is little or no stress on the system. A low baseline indicates a better user experience, resulting in applications responding faster in the environment.
- **VSIlavg:** This fixed number index gives a standardized performance measurement (in milliseconds) for a system that is simultaneously used by a specific number of active users.
- **VSImax:** The maximum number of desktop sessions attainable on the host before experiencing degradation in host and desktop performance.

HPE used Login VSI 4.1.32.1 to perform the tests. The VMs were balanced across each of the servers, maintaining a consistent number of VMs on each node. All virtual machines were powered on, registered, and idle prior to starting the actual test session.

## Test results

The following are the results of tests:

**Table 5.** Test results

| Test case              | VSIBase | VSImax average | VSImax reached |
|------------------------|---------|----------------|----------------|
| 700 Knowledge Workers  | 666 ms  | 1489 ms        | No             |
| 1000 Knowledge Workers | 647 ms  | 1116 ms        | No             |

### 700 Knowledge Worker users

VSIBase for the environment was 666 ms, and VSImax was not reached in any run. VSImax average was 1489 ms, and VSImax threshold was 1666 ms. Latency was consistently low, showing how the HPE SimpliVity infrastructure could easily handle the 700 Knowledge Worker users.



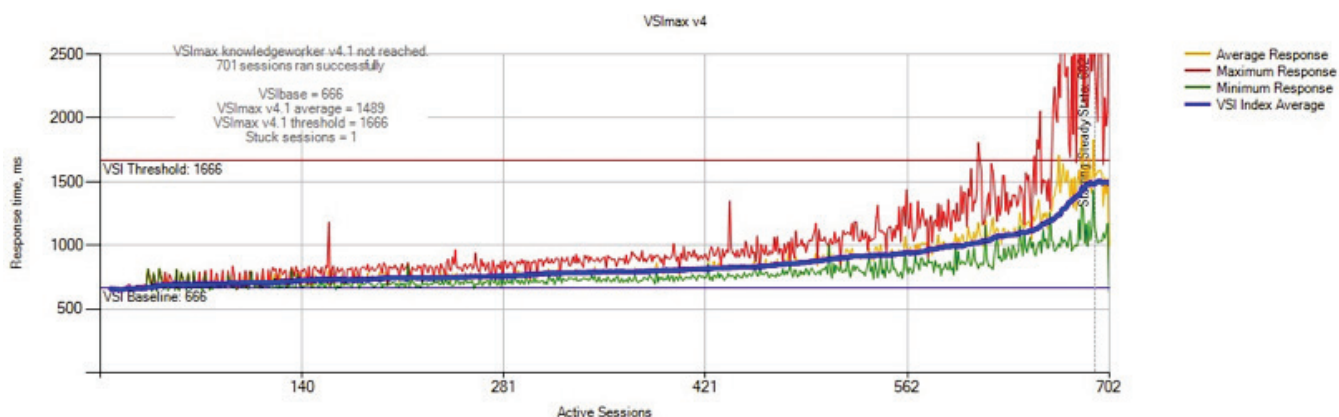


Figure 6. 700 Knowledge Worker Test

## 1000 Knowledge Worker users

VSIbase for the environment was 647 ms, and VSI max was not reached in any run. VSI max average was 1116 ms, and VSI max threshold was 1647 ms. Latency was consistently low, showing how the HPE SimpliVity infrastructure could easily handle the 1000 Knowledge Worker users.

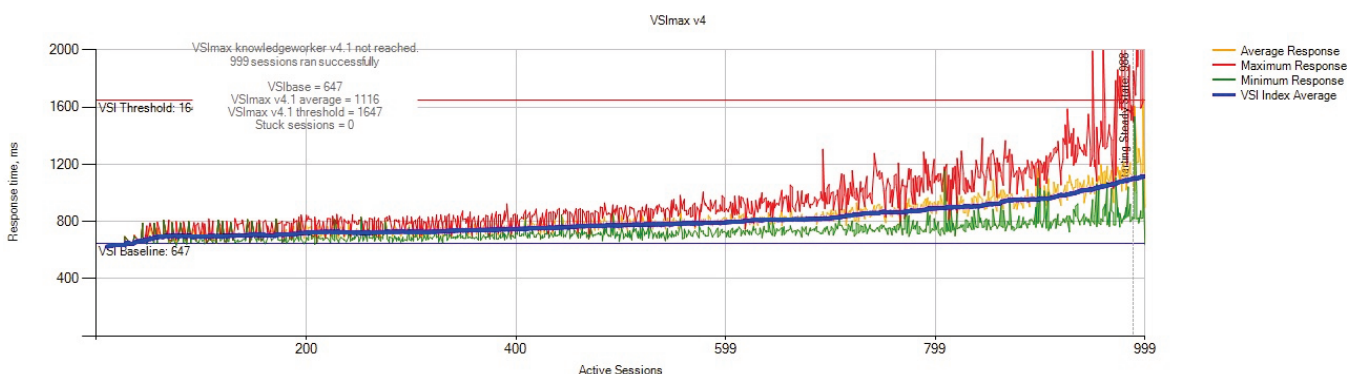


Figure 7. 1000 Knowledge Worker Test

## Analysis of test results from Login VSI

Tiny and turbocharged is how this hyperconverged solution can be described, based on the latest HPE SimpliVity 2600 architecture, leveraging the HPE SimpliVity XL170r nodes. In just 4U this white paper demonstrates high performance for 700 and 1000 Knowledge Workers. Think about that... you could almost fill a room with that many laptops. Moore's law is definitely in effect here as HPE SimpliVity demonstrates the Intel Xeon Gold 6152 server architecture, capable of up to 8 nodes in that 4U footprint.

Let's look at the performance profile in this white paper. With so much power in this little package, it's no surprise that they didn't hit VSI max. In the HCI community this is common, so we'll look at a couple of different Login VSI metrics—VSIbase and VSI max average (VSIavg). First, HPE SimpliVity is careful to allocate this infrastructure by not oversubscribing CPU or memory. With fixed memory, you get fixed number of desktops per host. With fixed number of desktops per host, on a tiny turbocharged system, you don't hit VSI max because you have plenty of headroom to offer performance. So, what do you do with that headroom? You offer a great user experience through less latency (more responsiveness).

## About the Login VSI performance numbers

### About the VSIbase

For this white paper, the VSIbase for the 4-node, 700 session configuration is 666 ms. The VSIbase for the 6-node 1000 session system is 638 ms. You can immediately see the benefit of the two additional nodes as the end-user experienced a reduction in latency. At less than 800, these numbers are considered very good.





## About the VSlavg

With VSlavg we look at how that latency changes as the workload increases—more work equals more latency. The following is a table highlighting these factors for this white paper.

**Table 6.** Validated by Login VSI analysis of results

| Number of sessions | Number of compute nodes | VSlavg 100 | VSlavg 250 | VSlavg 500 | VSlavg 1000 |
|--------------------|-------------------------|------------|------------|------------|-------------|
| 700                | 4                       | 703        | 751        | 879        | *           |
| 1000               | 6                       | 697        | 723        | 773        | 1116**      |

\* The max sessions in this test was 700. VSlavg at 700 sessions was 1498.

\*\*VSlavg 1000 here is based on a 999 session value

Lastly, it should be noted that HPE SimpliVity had 0 stuck sessions on 1000 user test and only one stuck session on the 700 user test. NICE job.

## VSI conclusion and additional notes

Using the latest and greatest in their gear, we certainly see the latency go down and the slope at which the latency grows is very slight, leaving less than a second's difference between the baseline and latency at 700 and 1000 sessions. Note that at 4 nodes we see the latency start to grow a little more rapidly than the very gentle slope using 6 nodes.

Some other points of interest:

- Windows 10 LTSB: HPE SimpliVity uses Windows 10 LTSB, which helps with some of the PDF interactions and File Type Associations with Microsoft Edge.
- VMware Horizon® Client: HPE SimpliVity uses Direct-Desktop Connections for their testing. This helps to scale the launcher environment and stabilize testing. If the Horizon client were to be used there would likely be an increased demand on the system resources. This may or may not have an impact on session count.
- Spectre/Meltdown: It looks like some of the components in this configuration may have mitigations in place for the hypervisor and processor microcode, and the performance is still really good. Windows 10 LTSB wouldn't have the patches since it is from 2016. With the latest Intel® processor technology, hypervisor versions and OS release, the performance impact from Spectre and Meltdown is expected to be very low.
- Windows 10 and Office 2016: Using the latest OS and Office builds are great examples for the enterprises looking to learn from these white papers. These builds carry more of an impact than their predecessors, so it is nice to see good performance numbers using the latest software.

## Summary

Utilizing HPE SimpliVity hyperconverged infrastructure dramatically simplifies IT systems management. The HPE SimpliVity solution delivers industry-leading data efficiency, global unified management, and built-in data protection. For client virtualization environments, HPE SimpliVity provides an unmatched user experience without compromising desktop density or resiliency.

## About Login VSI

The company, Login VSI, provides end-user performance insights for virtualized desktop and server-based computing environments. Enterprise IT departments use its flagship product Login VSI (for scalability testing) and new addition Login PI (for availability testing). In all phases of the virtual desktop deployment—from planning and deployment to change management—it helps build and safeguard high performance, high availability, and (as a result) the optimal end-user experience. With minimal configuration, Login VSI's products work with VMware Horizon View, Citrix® XenApp and XenDesktop®, Microsoft Remote Desktop Services (Terminal Services), and any other Windows-based virtual desktop solution. For more information, or a free trial, visit [loginvsi.com](http://loginvsi.com).

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## Resources and additional links

HPE Servers

[hpe.com/servers](http://hpe.com/servers)

HPE Storage

[hpe.com/storage](http://hpe.com/storage)

HPE Networking

[hpe.com/networking](http://hpe.com/networking)

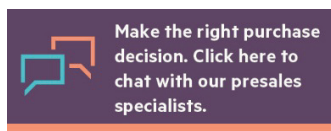
HPE Pointnext

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