

# Virtual Desktop Infrastructure (VDI): How to Scale and Optimize for Today's Realities

“VMware gives us simplified management of our entire infrastructure, saving us time and money while allowing us to be more responsive to faculty and researchers.”

JAMES DUNCAN  
DIRECTOR OF INFORMATION AND COMMUNICATIONS TECHNOLOGY  
SHERIDAN COLLEGE

## KEY BENEFITS

Cut deployment and management time by choosing a proven, verified solution from Intel and VMware:

- Support an average of 87% more virtual desktops by deploying Intel® Optane™ technology with VMware® vSAN™
- Reduce TCO \$/VDI user up to 16% by adding Intel Optane persistent memory

Increase business resiliency by giving staff anywhere access with VMware Horizon® virtual desktops:

- Improve data center agility with VMware vSAN software-defined storage on 2nd Gen Intel® Xeon® Scalable processors and reduce latency and increase QoS with Intel Optane SSDs
- Streamline IT management with a unified VMware vSphere® integrated hyper-converged solution
- Increase security by keeping important data in a single location

## Why VDI?

In a constantly changing world, the business imperative to equip your workforce with the ability to work from remote locations as part of your business resiliency strategy has never been more urgent. Virtual desktop infrastructure (VDI) solutions allow workers to log into their workspaces from anywhere in the world on any system or device while the organization protects and maintains control of critical data managed from a single location. Because the apps themselves are not tied to a specific machine, business can continue even when workers are away from the office or they need to work from a different device. In addition to employee productivity gains, VDI helps reduce operational expense and improves security vs. a traditional model with standalone end-user systems.

VMware Horizon® is a virtual desktop solution optimized for the software-defined data center that delivers virtual desktops and apps through a single unified workspace. And, as the need for remote work increases, even organizations that already support VDI can benefit from maximizing CPU performance to increase user count so that the entire workforce gets the resources they need.

## Meeting challenges—performance, space constraints, and flexibility—with hyperconverged infrastructure (HCI)

Let's be blunt: traditional server and storage array models are expensive. One way to reduce these costs and modernize your data center is by using the latest hardware and software-defined storage solutions (such as industry-leading VMware® vSAN™) to align compute, storage, and networking into a unified HCI stack with single-point management. Because HCI can eliminate the high costs, complexity, and performance limitations of traditional storage, HCI makes a particularly attractive platform for implementing VDI. This is especially true for organizations whose VDI users work with multiple or latency-sensitive apps. The demand of these workloads can significantly benefit from powerful compute and storage resources such as 2<sup>nd</sup> Gen Intel® Xeon® Scalable processors with Intel® Optane™ technology.

## Optimize performance of your VMware VDI environment with Intel technologies

### Data-centric innovation with 2<sup>nd</sup> Generation Intel Xeon Scalable processors

VDI workloads depend on high levels of CPU performance to support more users, so selecting the right processor with the appropriate number of cores and frequency is key to meet the demands of high-performing virtual workforces. From the 2<sup>nd</sup> Generation Intel Xeon Scalable processor family, the Intel Xeon Gold 6258R processor is workload optimized and purpose built for high-density deployments to meet performance needs for the most strenuous workloads. 2<sup>nd</sup> Generation Intel Xeon Scalable processor-based platforms boost business resiliency with hardware-enhanced security while providing agile service delivery for whatever applications virtual desktop users may need to run.

**BERLINER STADTREINIGUNG MAKES GOING GREEN FASTER AND EASIER**

When Europe's largest municipal sanitation operations company, Berliner Stadtreinigung (BSR), required increasing numbers of employees for workplace flexibility, the organization turned to VMware to implement an appropriate solution while reducing administration costs and improving IT security.

The 5,400-strong BSR workforce desired seamless working; previously, office employees required an unacceptable amount of time to log on and log off due to central server-stored profiles. Also, hardware downtime and migration projects created high administration effort, and waste collectors relied on hand notation to report problems on routes, causing delays which in turn led to customer complaints.

**HOW THEY DID IT**

BSR implemented a VMware Horizon virtual desktop infrastructure with App Volumes on vSAN hyper-converged infrastructure with Intel Xeon Scalable processor-powered servers to deliver remote working for employees and a mobile app to waste collectors via Workspace ONE, powered by AirWatch technology.

These technologies allowed BSR to achieve their goals of greater workplace flexibility, decreased administrative costs, improved security, and reduced ecological footprint, all at an affordable cost.

**Overcome data challenges with Intel Optane Persistent Memory (PMem)**

Intel Optane PMem revolutionizes memory technology by offering affordable large capacity and support for data persistence. In this study, adding Intel Optane PMem to the 2<sup>nd</sup> Generation Intel Xeon Scalable processor platform expanded memory that enabled increased CPU utilization to deliver more virtual desktops.

**Improve storage IO response times with Intel Optane SSD DC P4800X Series and Intel 3D NAND SSDs**

A VMware vSAN storage caching solution powered by Intel Optane SSDs delivers high-endurance and low latency to improve performance for vSAN's write-intensive cache tier. High performing VDI workloads can benefit from the combination of Intel Optane SSDs in the cache tier and Intel 3D NAND SSDs in the capacity tier. Together with VMware vSAN, this storage solution can deliver improved VM performance through the combination of lower latency, increased throughput and massive storage capacity. This can ultimately help to enable up to 33% increase in overall VM density and storage consolidation in your data center, providing cost-effective scalability with more VMs at an improved cost/performance.<sup>1</sup>

**Reduce complexity through hyper-convergence with the VMware Software Solutions Stack**

Moving to a software-defined data center with VMware increases agility and flexibility, reduces complexity, eases administrative burdens, and delivers high performance for heavy virtual desktop workloads by allowing compute, storage, and networking to be consolidated in one place. By using this VMware Software Solutions Stack—vSphere as hypervisor, vSAN to pool storage, and Horizon 7 to deliver virtual desktops—organizations can take advantage of single-point management with VMware vCenter® and deliver the desktops they need at scale and at pace.

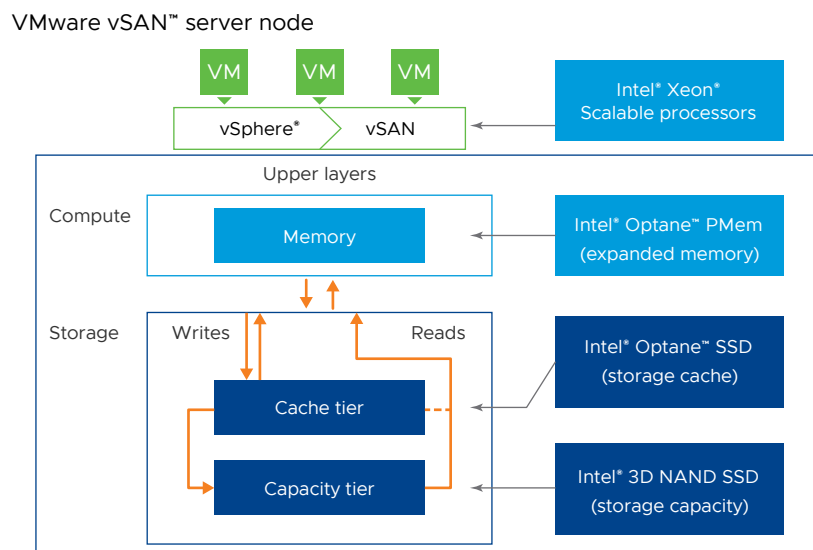


FIGURE 1: How Intel Optane SSDs and persistent memory work together

### SHERIDAN COLLEGE GIVES STUDENTS THE MOBILITY THEY CRAVE

Sheridan College in Ontario, Canada wanted to provide its expanding—and increasingly mobile—student body with a common end-user computing platform they could access using their own devices, from anywhere. Sheridan's challenges for this project included making the best use of classroom and data center space and integrating sustainability into IT to support hundreds of ongoing applied research projects.

### HOW THEY DID IT

Adopting Horizon VDI on a hyper-converged vSphere and vSAN solution on Intel Xeon Scalable processor-powered servers was key to Sheridan College's success in this project. Students relished the robust mobile learning experience where they could access their data from laptops, mobile devices, or clients in campus labs. Hosting virtual desktops on HCI helped Sheridan maximize data center space, delivering linear scalability, improved manageability, and an overall lower TCO. As student enrollment grows, administrators can quickly and easily add new virtual desktops to support them.

### Scale users easily

A recent study conducted by Principled Technologies found adding Intel Optane PMem alongside small amounts of traditional DDR DRAM enabled this Intel and VMware vSAN solution to support an average of 87 percent more virtual desktops on a four-node VMware vSAN cluster powered by new Intel Xeon Gold 6258R processors, compared to the same cluster with 384GB DDR DRAM alone. While the number of VDI users depends on CPU capabilities, the study found adding more memory enabled more efficiency or higher utilization of CPU resources, which led to the increase in VDI users. The View Planner high memory workload simulates users concurrently running multiple office apps and opening multiple web browser windows. Testing with these demanding memory requirements means if your users use less-memory-intensive apps, you could see even higher virtual desktop counts with these configurations.

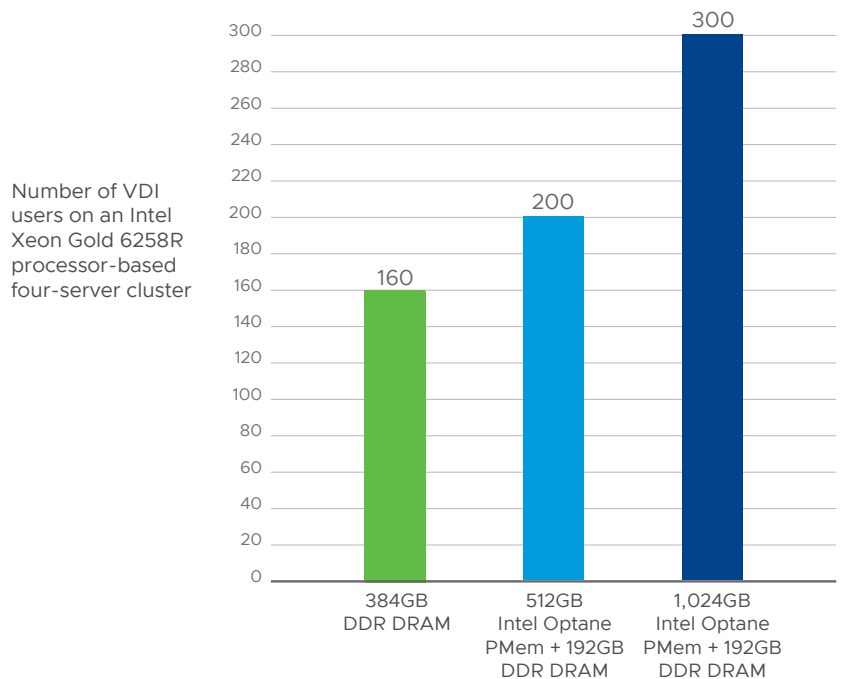


FIGURE 2: Number of VDI users on a four-server VMware vSAN cluster using Horizon, as measured by View Planner. Higher is better. *Source: Principled Technologies<sup>2</sup>*

Extending memory with Intel Optane PMem, alongside Intel Optane SSDs for storage caching and Intel 3D NAND SSDs for capacity storage, can help maximize your organization's new hardware investment by consolidating the number of server nodes you must purchase, store, and manage. Choosing a baseline vSAN configuration with Intel Xeon Gold 6258R processor-based servers and DDR DRAM alone offers strong performance, with four nodes supporting 160 users. But upgrading that same cluster with Intel Optane PMem can help you save in different ways, depending on your specific virtual desktop needs:

- If you need to support as many users as possible, upgrading with increasing amounts of Intel Optane PMem can enable the solution to support more VDI sessions cost effectively.
- For a given number of users, you may be able to consolidate the number of server nodes previously required by increasing the Intel Xeon Scalable processor to a higher number of cores/frequency, and by adding Intel Optane PMem to each node.

**TRANSFORMING HEALTHCARE TO FOCUS ON PATIENTS WITH REGION VÄSTRA GÖTALAND**

Region Västra Götaland (VGR), the county council governing the territory Västra Götaland in Sweden, is responsible for delivering healthcare to nearly one-fifth of Sweden's population. Existing IT infrastructure was complex and slow, creating huge problems for staff and patients, with some staff reporting wait times of up to 45 minutes to log in or access patient records. These frustrations led to valuable medical staff resigning because they felt unable to provide quality patient care in this environment. VGR sought new IT tools to transform the experience of employees and patients alike.

**HOW THEY DID IT**

With help from VMware Professional Services, VGR implemented VMware Horizon desktops with VMware vSAN on Intel Xeon Scalable processor-powered servers so clinical staff could access their data from any workspace. VGR stated that the VMware solution has delivered 75 percent faster access to patient records and freed up 10 hours per month for each person on staff, allowing them to improve patient care. The organization estimates they will get back 350,000 patient care hours per month—a dramatic leap in patient care focus for a large segment of Sweden's population.

**Scale TCO in a VDI environment cost effectively**

Investing in a reliable, high performing VDI environment doesn't have to blow your IT budget. By selecting a powerful VMware vSAN cluster based on Intel Xeon Gold 6258R servers and Intel Optane SSDs and then augmenting the solution with Intel Optane PMem, your organization can support more VDI users for less. Compared to a baseline of 384GB DDR DRAM only that supported 160 users, adding Intel Optane PMem increased the number of virtual users supported by an average of 87%, to 300 users, while lowering the TCO \$/VDI user by up to 16%—which means you can support 20% more VDI users per dollar.

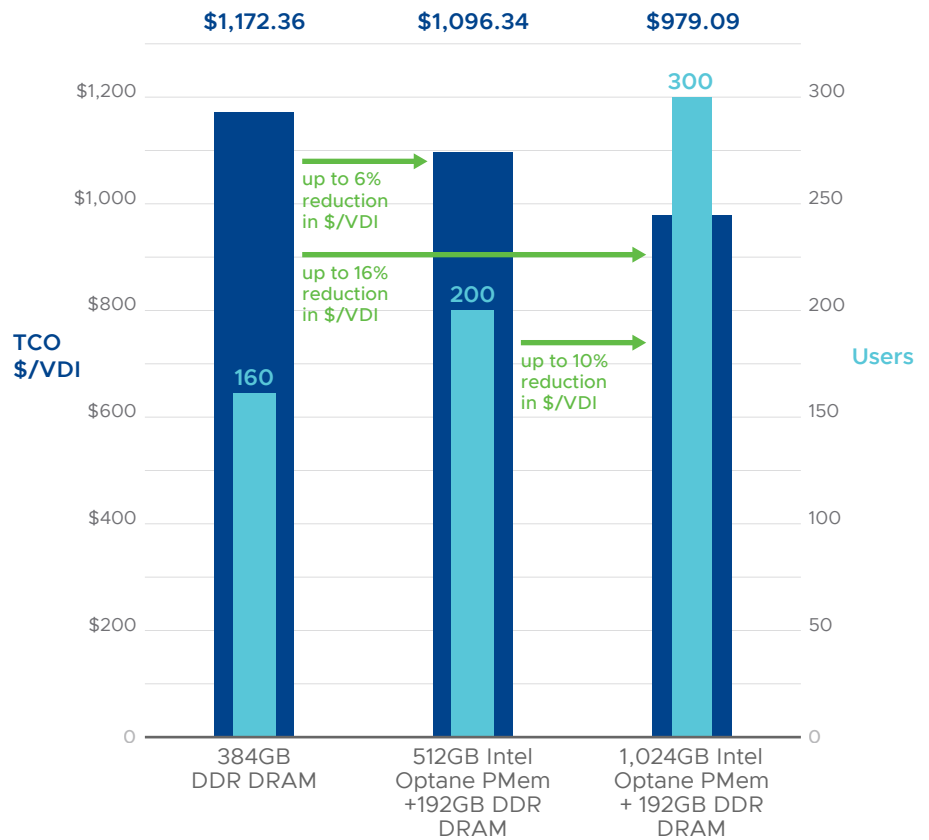


FIGURE 3: Total cost per virtual desktop user (in USD) vs. total virtual desktop count.

**Intel Select Solutions for VMware vSAN: Proven performance on verified infrastructure**

Reduce your risk and speed your time to solve pressing deployment mandates by choosing Intel Select Solutions for vSAN, a subset of the certified vSAN ReadyNodes™. Comprising verified hardware and software stacks combining Intel Xeon Scalable processors, Intel Optane PMem, Intel Optane SSDs, Intel 3D NAND SSDs, and Intel Ethernet Network adapters, these performance verified server configurations allow organizations to deliver joint VMware and Intel solutions to employees and customers faster—because Intel and VMware have already optimized the solution for a specific workload or use case.

Multiple server vendors deliver these solutions to market through certified channel partners, meeting or exceeding the minimum performance threshold established by Intel and VMware.

### View from the Analysts about VMware VDI Solutions

VMware was named a LEADER in the 2019-2020 IDC Marketscape, "Worldwide Virtual Client Computing Vendor Assessment, for the 5th straight report.<sup>3</sup> VMware was also named a Leader in The Forrester Wave™ for Unified Endpoint Management, Q4 2019 with the TOP RANKED solution in the current offering and strategy categories; HIGHEST possible scores in the product roadmap, roadmap execution, and partner ecosystem criteria; and the HIGHEST possible score in the market presence category.<sup>4</sup> As well, VMware was positioned as a Leader in the 2019 Gartner Magic Quadrant for Unified Endpoint Management Tools for the second consecutive year based on Gartner's evaluation of VMware's ability to execute and completeness of vision.<sup>5</sup>

### Summary

Modernizing your infrastructure by moving to the latest software-defined data center solutions from VMware and Intel can future proof your data center and bolster business resiliency in our ever-changing world. Moving to VDI on an Intel-based VMware vSAN solution and scaling up with new Intel Xeon Gold 6258R processors and Intel Optane technology can:

- Improve business resiliency by giving employees anywhere access to the data they need
- Enable support for more virtual desktops or consolidate to fewer server nodes to meet your needs
- Reduce TCO \$/VDI user by up to 16% when adding Intel Optane PMem
- Accelerate applications, reduce transaction costs and improve overall data center efficiency with Intel Optane SSDs
- Provide better time to value with a verified foundation for hyper-converged infrastructure with Intel Select Solutions
- Reduce data center complexity and ease management burdens

This future-forward virtual desktop-optimized solution can provide your organization a verified and trusted way to achieve VDI on HCI at scale to meet your business objectives now and provide easy expansion as your needs grow.

For more information on the VDI on HCI benchmarking by Principled Technologies, visit [here](#). For more information on implementing Horizon VDI on HCI Select Solution for vSAN, visit [here](#). To learn more about the Intel/VMware alliance, visit [here](#).

1. <https://itpeernetwork.intel.com/vSAN-Optane-Scalable/>
2. In the Principled Technologies white paper (<https://www.principledtechnologies.com/VMware/VMware-HCI-Intel-Optane-VDI-0420.pdf>), the 200 user proof point was obtained by using 512GB Optane PMem + 96GB DRAM, using 8GB DIMMS. Principled Technologies also tested 16GB DIMMs and this data reference is located in the report supplement here: <https://www.principledtechnologies.com/VMware/VMware-HCI-Intel-Optane-VDI-science-0520-v2.pdf>. We chose to highlight the configuration using the 16GB DIMMS in this solution brief as 8GB DIMMs are becoming difficult to find and 16GB DIMMs are coming down in price. Three-year TCO estimates as of April 2020, includes hardware, hardware support, software licensing and support. Intel® Optane™ persistent memory pricing and DRAM pricing referenced in TCO calculations is provided for guidance and planning purposes only and does not constitute a final offer. Pricing guidance is subject to change and may revise up or down based on market dynamics. Please contact your OEM/distributor for actual pricing. Software licensing and support includes VMware Horizon 7 Advanced production concurrent user licensing at <https://store-us.vmware.com/vmware-horizon-advanced-298798300.html> and VMware vSphere Enterprise Plus production concurrent user licensing at <https://store-us.vmware.com/vmware-vsphere-enterprise-plus-284281000.html>. Performance results may not reflect all publicly available security updates. TCO \$/VDI user calculated by dividing the 3-year TCO estimate by the average VDI users per given configuration. VDI users / TCO \$ calculated by dividing the average VDI users by the three-year TCO estimate per given configuration. For all tested configurations, each test was run three times and the average number of VDI users was used.
 

**160 User Configuration: Intel Xeon Gold 6258R Processor – 384GB RAM:** 4 Node, 2x Intel Xeon Gold 6258R Processor, 1x Intel Server Board S2600WFT, Total memory: 384GB DDR4, 12 slots/32GB/2666 MT/s, Hyperthreading: Enabled, Turbo: Enabled, Intel VMD: Enabled, Storage (boot): 1x 960GB Intel SSD 3520 Series SATA, Storage (cache): 2x 375GB Intel Optane DC SSD P4800X Series, Storage (capacity): 6x 2TB Intel SSD DC P4510 Series PCIe NVMe, Network devices: 1x Intel Ethernet CNA XXV710-DA2 at 25GbE, Network speed: 25GbE, OS/Software: VMware 6.7.0 U1 and VMware Horizon 7. Testing by Principled Technologies. Tested between Feb 2-28, 2020 using VMware View Planner 4.3: 160 high-memory users (2 vCPUs, 16GB Memory, 50GB Disk space)

**200 User Configuration: Intel Xeon Gold 6258R Processor – 512GB DCPMM:** 4 Node, 2x Intel Xeon Gold 6258R Processor, 1x Intel Server Board S2600WFT, Total memory: 512GB Intel Optane DC persistent memory, 4 slots/128GB/2666 MT/s and 192GB DDR4, 12 slots/16GB/2666 MT/s, Hyperthreading: Enabled, Turbo: Enabled, Intel VMD: Enabled, Storage (boot): 1x 960GB Intel SSD 3520 Series SATA, Storage (cache): 2x 375GB Intel Optane DC SSD P4800X Series, Storage (capacity): 6x 2TB Intel SSD DC P4510 Series PCIe NVMe, Network devices: 1x Intel Ethernet CNA XXV710-DA2 at 25GbE, Network speed: 25GbE, OS/Software: VMware 6.7.0 U1 and VMware Horizon 7. Testing by Principled Technologies. Tested between Feb 2-28, 2020 using VMware View Planner 4.3: 200 high-memory users (2 vCPUs, 16GB Memory, 50GB Disk space)

**300 User Configuration: Intel Xeon Gold 6258R Processor – 1024GB DCPMM:** 4 Node, 2x Intel Xeon Gold 6258R Processor, 1x Intel Server Board S2600WFT, Total Memory: 1,024GB Intel Optane DC persistent memory, 8 slots/128GB/2666 MT/s and 192GB DDR4, 12 slots/16GB/2666 MT/s, Hyperthreading: Enabled, Turbo: Enabled, Intel VMD: Enabled, Storage (boot): 1x 960GB Intel SSD 3520 Series SATA, Storage (cache): 2x 375GB Intel Optane DC SSD P4800X Series, Storage (capacity): 6x 2TB Intel SSD DC P4510 Series PCIe NVMe, Network devices: 1x Intel Ethernet CNA XXV710-DA2 at 25GbE, Network speed: 25GbE, OS/Software: VMware 6.7.0 U1 and VMware Horizon 7. Testing by Principled Technologies. Tested between Feb 2-28, 2020 using VMware View Planner 4.3: 300 high-memory users (2 vCPUs, 16GB Memory, 50GB Disk space)
3. Source: "IDC MarketScape Worldwide Virtual Client Computing Software 2019-2020 Vendor Assessment," doc #US45752419, January 2020.
4. The Forrester Wave™ is copyrighted by Forrester Research, Inc. Forrester and Forrester Wave are trademarks of Forrester Research, Inc. The Forrester Wave is a graphical representation of Forrester's call on a market and is plotted using a detailed spreadsheet with exposed scores, weightings, and comments. Forrester does not endorse any vendor, product, or service depicted in the Forrester Wave. Information is based on best available resources. Opinions reflect judgment at the time and are subject to change.
5. Source: Gartner, Inc., "Magic Quadrant for Unified Endpoint Management Tools," Chris Silva, et al, August 06, 2019. This graphic was published by Gartner, Inc. as part of a larger research document and should be evaluated in the context of the entire document. The Gartner document is available upon request from VMware. Gartner Disclosure: Gartner does not endorse any vendor, product or service depicted in its research publications, and does not advise technology users to select only those vendors with the highest ratings or other designation. Gartner research publications consist of the opinions of Gartner's research organization and should not be construed as statements of fact. Gartner disclaims all warranties, expressed or implied, with respect to this research, including any warranties of merchantability or fitness for a particular purpose.