

The Challenge

Organizations are rapidly mobilizing on the top priorities for their business success. Among these priorities are boundaryless and redefined worker experiences. This enables the following:

Solution Snapshot

Intel® Data Center Solutions for VMware Horizon



Top Trends

- 83% of global workers prefer the hybrid work model¹
- In 2024, enterprises with intelligent and collaborative work environments will see 30% lower staff turnover, 30% higher productivity, and 30% higher revenue per employee than their peers²
- The global virtual desktop infrastructure market size is projected to grow from \$12.72 billion in 2023 to \$57.67 billion by 2030, at a CAGR of 24.1%³

Desired Business Capabilities

- Use technology to provide a hybrid Total Experience (TX) platform for distributed workers
- Quickly adapt to work models, supporting hybrid, and remote workers from anywhere
- Workers are able to access data swiftly, seamlessly, and securely
- Boost security and productivity in hybrid work environments
- Deliver interactive, personalized collaboration for employees, suppliers, partners, and customers

Virtual Desktop Infrastructure (VDI)

- Enable cost-effective infrastructure extension with automated performance
- Scale IT resources quickly through centralized management
- Troubleshoot and resolve issues quickly




Virtual Desktop Infrastructure magnifies the benefits of hyper-converged infrastructure (HCI) to deliver simplicity, scalability, cost-effectiveness, and operational efficiency.⁴

Use Cases⁵

-  Manage From the Cloud
-  Help Secure Data and Achieve Compliance
-  Modernize Operations
-  Work from Anywhere
-  Build Resiliency
-  Improve ROI

Desktop images run within virtual machines (VMs), and end-user devices access them over a network. Understanding your worker types – task, knowledge, and power – will help define the requirements of your solution.

Choosing the Right Processing Platform

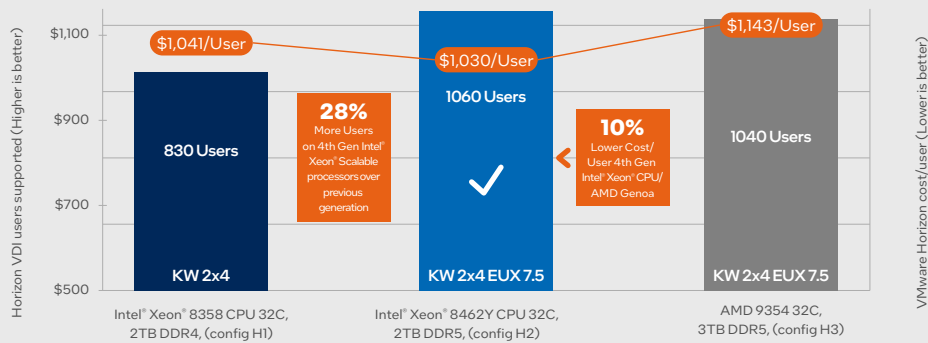
 <p>Task Workers</p> <ul style="list-style-type: none"> ▪ Single task ▪ Minimal applications <hr/> <p>Small VM Size</p> <hr/> <p>CPU</p>	 <p>Knowledge Workers</p> <ul style="list-style-type: none"> ▪ Complex tasks ▪ Video collaboration ▪ Spreadsheets ▪ Slide prep ▪ Heavy browser use <hr/> <p>Moderate VM Size</p> <hr/> <p>CPU (Possible + GPU)</p>	 <p>Power Workers</p> <ul style="list-style-type: none"> ▪ Content creation ▪ CAD/CAM ▪ Video production ▪ Graphics power users <hr/> <p>Large VM Size</p> <hr/> <p>CPU + GPU</p>
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VMware Horizon Overview and Benefits

VMware Horizon enables a digital workspace with the efficient delivery of virtual desktops and applications that equip workers anywhere, anytime, and on any device. With deep integration into the VMware technology ecosystem, the platform offers an agile cloud-ready foundation, modern best-in-class management, and end-to-end security that empowers today's Anywhere Workspace.

CPU-Only Proof Points

Lower Cost/User versus AMD
28% More Users at a Lower Cost/User versus Previous Generation Intel® CPUs.⁶



4th Gen Intel® Xeon® Processors support more users (1060 versus 1040) at a lower cost/user (\$1,030 versus \$1,143) versus AMD.

Compared to 3rd Gen Intel® Xeon® Processors, 4th Gen Intel® Xeon® Processors support more users (1060 versus 830) at a lower cost/user.

Pick the configuration to best suit your needs at an average price of \$1,060 /user.

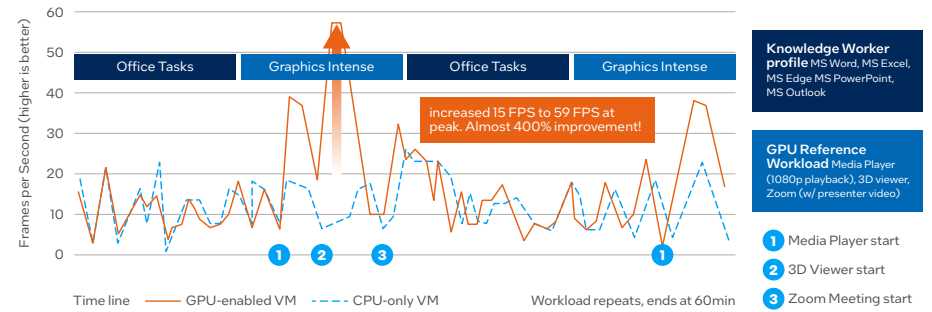


4th Gen Intel® Xeon® Processors (24C / 32C) DDR5 versus 3rd Gen Intel® Xeon® Platinum Processors (32C) DDR4.⁷

GPU Proof Points

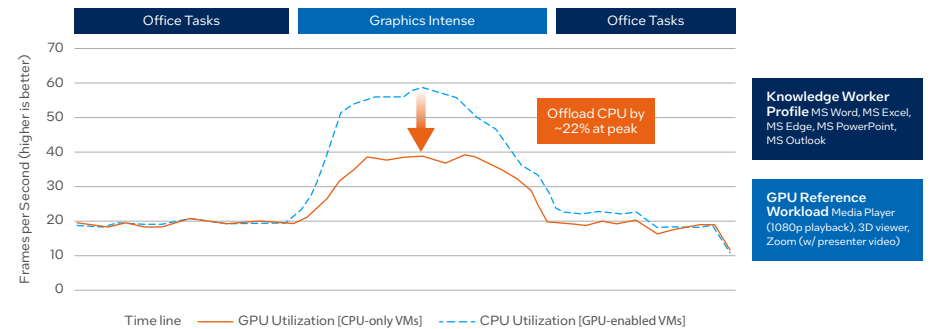
Increase frame rates for users during graphics-intensive tasks by adding an Intel® Data Center GPU Flex 140.

Frames Per Second: In recent tests, the average frame rate for a single user, while 96 users were running, increased from 15 FPS to a peak of 59 FPS on GPU-enabled VMs when running the combined Knowledge Worker & GPU Reference Profile.



4th Gen Intel® Xeon® Platinum Processor (32C) with Intel® Data Center GPU Flex 140s & VMware Horizon on a 4-node cluster of 2S servers with VMware vSAN (8.0u2)⁸

Decrease CPU utilization on the cluster by adding an Intel® Data Center GPU Flex 140.
96 combined KW+GPU users on GPU-enabled VMs and CPU-only VMs.



4th Gen Intel® Xeon® Platinum processor (32C) with Intel® Data Center GPU Flex 140s & VMware Horizon on a 4-node cluster of 2S servers with VMware vSAN (8.0u2)⁸



Why Intel for VMware Horizon?

VMware Horizon with 4th and 5th Gen Intel® Xeon® Scalable Processors with the Intel® Data Center GPU Flex Series for VDI workloads.

- VDI makes it easy to update enterprise IT infrastructures to meet the needs of today's hybrid workforce by streamlining deployment, increasing flexibility, helping with security, and simplifying management.
- Depending on the users' workload, GPUs can handle heavy graphics work or improve the user's experience. VDI is CPU-intensive, and correct memory sizing is critical.



- Intel® Data Center GPU Flex Series 140 supports graphics-intensive workloads, freeing your CPU to support additional tasks or users.
- Graphics-intensive workloads benefit from a GPU, supporting higher frame rates.
- 4th and 5th Gen Intel® Xeon® Scalable processors offer optimized end-user performance and outstanding VM density. Intel® Data Center GPU Flex Series provides a cost-effective way to enhance the user experience and boost productivity.

Enable a Mix of CPU and GPU Users with Max Density

Choose: Intel® Xeon® 8562Y+ Processor with Intel® Data Center GPU Flex Series

Enable Light GPU and Office workers

Choose: Intel® Xeon® 6542Y Processor with Intel® Data Center GPU Flex Series

Want More Information?

Contact Intel® Partner Alliance or an Intel® Account Executive to learn how to modernize your data center with VMware Horizon solution.

Read more:

- VMware Horizon
- Intel® Data Center Solutions
- Intel® Data Center GPU Flex Series

Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.0, 21216066, vCenter-8.0.0, 21216066, Horizon 8.9.0 2303 Build 21593375, Login/VS1 5.2.2. Knowledge worker profile 2vCPU/4GB, EUX 7.5. Tested by Evaluator Group as of August 2023.

Config H2 – 4th Gen Intel® Xeon® Platinum Processor (32c), 1060 users 4-node, Each node, QuantaGrid D54Q-2U, 2x Intel® Xeon® Platinum 8462Y+ processor (32C, 2.8GHz, 300W TDP), HT On, Turbo On, SNC OFF, Total Memory: 2 TB (32x64GB DDR5 2DPC 4800 MHz), ucode: 0x2b000161, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.0, 21216066, vCenter-8.0.0, 21216066, Horizon 8.9.0 2303 Build 21593375, Login/VS1 5.2.2. Knowledge worker profile 2vCPU/4GB, EUX 7.5 Tested by Evaluator Group as of August, September, October 2023.

Config H3 – AMD Genoa (32c), 1040 users 4-node, Each node: SMC AS-2025HS-TNR, 2x AMD 9354 (32C, 3.25GHz, 280W TDP), SMT On, Boost On, NPS=1, Total Memory: 3 TB (24x128GB 4800 MHz), ucode: 0x0a101000, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.0, 21216066, vCenter-8.0.0, 21216066, Horizon 8.9.0 2303 Build 21593375, Login/VS1 5.2.2. Knowledge worker profile 2vCPU/4GB, EUX 7.5 Tested by Evaluator Group as of August 2023.

7. Intel® Xeon® 8462Y CPU versus Intel® Xeon® 8358 CPU. Average cost/user data shown in graph. See configuration for details. Results may vary.

Config H1 – 3rd Gen Intel® Xeon® Platinum Processor (32c), 830 users 4-node, Each node, Intel® Software Development Platform, 2x Intel® Xeon® Platinum 8358 processor (32C, 2.6GHz, 250W TDP), HT On, Turbo On, SNC OFF, Total Memory: 2 TB (32x64GB DDR4 2DPC 3200 MHz), ucode: 0x0d000375, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.0, 21216066, vCenter-8.0.0, 21216066, Horizon 8.9.0 2303 Build 21593375, Login/VS1 5.2.2. Knowledge worker profile 2vCPU/4GB, EUX 7.5. Tested by The Futurum Group as of August 2023.

Config H2 – 4th Gen Intel® Xeon® Platinum Processor (32c), 1060 users 4-node, Each node, QuantaGrid D54Q-2U, 2x Intel® Xeon® Platinum 8462Y+ processor (32C, 2.8GHz, 300W TDP), HT On, Turbo On, SNC OFF, Total Memory: 2 TB (32x64GB DDR5 2DPC 4800 MHz), ucode: 0x2b000161, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.0, 21216066, vCenter-8.0.0, 21216066, Horizon 8.9.0 2303 Build 21593375, Login/VS1 5.2.2. Knowledge worker profile 2vCPU/4GB, EUX 7.5 Tested by The Futurum Group as of August, September, October 2023.

Config H3 – AMD Genoa (32c), 1040 users 4-node, Each node: SMC AS-2025HS-TNR, 2x AMD 9354 (32C, 3.25GHz, 280W TDP), SMT On, Boost On, NPS=1, Total Memory: 3 TB (24x128GB 4800 MHz), ucode: 0x0a101000, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.0, 21216066, vCenter-8.0.0, 21216066, Horizon 8.9.0 2303 Build 21593375, Login/VS1 5.2.2. Knowledge worker profile 2vCPU/4GB, EUX 7.5 Tested by Evaluator Group as of August 2023.

Config H4 – 3rd Gen Intel® Xeon® Platinum Processor (32c), 830 users 4-node, Each node, Intel® Software Development Platform, 2x Intel® Xeon® Platinum 8358 processor (32C, 2.6GHz, 250W TDP), HT On, Turbo On, SNC OFF, Total Memory: 2 TB (32x64GB DDR4 2DPC 3200 MHz), ucode: 0x0d000375, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.0, 21216066, vCenter-8.0.0, 21216066, Horizon 8.9.0 2303 Build 21593375, Login/VS1 5.2.2. Knowledge worker profile 2vCPU/8GB, EUX 7.5. Tested by The Futurum Group as of October 2023.

Config H5 – 3rd Gen Intel® Xeon® Platinum Processor (32c), 720 users 4-node, Each node, Intel® Software Development Platform, 2x Intel® Xeon® Platinum 8358 processor (32C, 2.6GHz, 250W TDP), HT On, Turbo On, SNC OFF, Total Memory: 2 TB (32x64GB DDR4 2DPC 3200 MHz), ucode: 0x0d000375, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.0, 21216066, vCenter-8.0.0, 21216066, Horizon 8.9.0 2303 Build 21593375, Login/VS1 5.2.2. Knowledge worker profile 4vCPU/8GB, EUX 7.5. Tested by The Futurum Group as of October 2023.

Config H6 – 4th Gen Intel® Xeon® Platinum Processor (32c), 950 users 4-node, Each node, QuantaGrid D54Q-2U, 2x Intel® Xeon® Platinum 8462Y+ processor (32C, 2.8GHz, 300W TDP), HT On, Turbo On, SNC OFF, Total Memory: 2 TB (32x64GB DDR5 2DPC 4800 MHz), ucode: 0x2b000161, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.0, 21216066, vCenter-8.0.0, 21216066, Horizon 8.9.0 2303 Build 21593375, Login/VS1 5.2.2. Knowledge worker profile 2vCPU/8GB, EUX 7.9 Tested by The Futurum Group as of October 2023.

Config H7 – 4th Gen Intel® Xeon® Platinum Processor (32c), 950 users 4-node, Each node, QuantaGrid D54Q-2U, 2x Intel® Xeon® Platinum 8462Y+ processor (32C, 2.8GHz, 300W TDP), HT On, Turbo On, SNC OFF, Total Memory: 2 TB (32x64GB DDR5 2DPC 4800 MHz), ucode: 0x2b000161, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.0, 21216066, vCenter-8.0.0, 21216066, Horizon 8.9.0 2303 Build 21593375, Login/VS1 5.2.2. Knowledge worker profile 4vCPU/8GB, EUX 7.5 Tested by The Futurum Group as of October 2023.

Config H8 – 4th Gen Intel® Xeon® Gold Processor (24c) 1TB, 790 users 4-node, Each node, QuantaGrid D54Q-2U, 2x Intel® Xeon® Gold 6442Y processor (24C/2.6GHz, 225W TDP), HT On, Turbo On, SNC OFF, Total Memory: 1 TB (16x64GB DDR5 2DPC 4800 MHz), ucode: 0x2b000161, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.0, 21216066, vCenter-8.0.0, 21216066, Horizon 8.9.0 2303 Build 21593375, Login/VS1 5.2.2. Knowledge worker profile 2vCPU/4GB, EUX 7.5. Tested by The Futurum Group as of October 2023.

Config H9 – 4th Gen Intel® Xeon® Gold Processor (24c) 1TB, 465 users 4-node, Each node, QuantaGrid D54Q-2U, 2x Intel® Xeon® Gold 6442Y processor (24C/2.6GHz, 225W TDP), HT On, Turbo On, SNC OFF, Total Memory: 1 TB (16x64GB DDR5 2DPC 4800 MHz), ucode: 0x2b000161, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.0, 21216066, vCenter-8.0.0, 21216066, Horizon 8.9.0 2303 Build 21593375, Login/VS1 5.2.2. Knowledge worker profile 2vCPU/8GB, EUX 8.3. Tested by The Futurum Group as of October 2023.

Config H10 – 4th Gen Intel® Xeon® Gold Processor (24c) 1TB, 465 users 4-node, Each node, QuantaGrid D54Q-2U, 2x Intel® Xeon® Gold 6442Y processor (24C/2.6GHz, 225W TDP), HT On, Turbo On, SNC OFF, Total Memory: 1 TB (16x64GB DDR5 2DPC 4800 MHz), ucode: 0x2b000161, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.0, 21216066, vCenter-8.0.0, 21216066, Horizon 8.9.0 2303 Build 21593375, Login/VS1 5.2.2. Knowledge worker profile 4vCPU/8GB, EUX 8.3. Tested by The Futurum Group as of October 2023.

Config H11 – 4th Gen Intel® Xeon® Gold Processor (24c) 2TB, 790 users 4-node, Each node, QuantaGrid D54Q-2U, 2x Intel® Xeon® Gold 6442Y processor (24C/2.6GHz, 225W TDP), HT On, Turbo On, SNC OFF, Total Memory: 1 TB (16x64GB DDR5 2DPC 4800 MHz), ucode: 0x2b000161, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.0, 21216066, vCenter-8.0.0, 21216066, Horizon 8.9.0 2303 Build 21593375, Login/VS1 5.2.2. Knowledge worker profile 2vCPU/4GB, EUX 7.5 Tested by The Futurum Group as of October 2023. ESTIMATED Results, based on results for Config H8, which was CPU Limited. Adding more memory would not change the result.

Config H12 – 4th Gen Intel® Xeon® Gold Processor (24c) 2TB, 770 users 4-node, Each node, QuantaGrid D54Q-2U, 2x Intel® Xeon® Gold 6442Y processor (24C/2.6GHz, 225W TDP), HT On, Turbo On, SNC OFF, Total Memory: 1 TB (16x64GB DDR5 2DPC 4800 MHz), ucode: 0x2b000161, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.0, 21216066, vCenter-8.0.0, 21216066, Horizon 8.9.0 2303 Build 21593375, Login/VS1 5.2.2. Knowledge worker profile 2vCPU/8GB, EUX 7.5 Tested by The Futurum Group as of October 2023.

Config H13 – 4th Gen Intel® Xeon® Gold Processor (24c) 2TB, 690 users 4-node, Each node, QuantaGrid D54Q-2U, 2x Intel® Xeon® Gold 6442Y processor (24C/2.6GHz, 225W TDP), HT On, Turbo On, SNC OFF, Total Memory: 1 TB (16x64GB DDR5 2DPC 4800 MHz), ucode: 0x2b000161, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.0, 21216066, vCenter-8.0.0, 21216066, Horizon 8.9.0 2303 Build 21593375, Login/VS1 5.2.2. Knowledge worker profile 4vCPU/8GB, EUX 7.5. Tested by The Futurum Group as of October 2023.

8. See configurations for details.

Config H1 – 4th Gen Intel® Xeon® Platinum Processor (32c), 96 users CPU-Only VMs 4-node, Each node, Intel® Software Development Platform, 2x Intel® Xeon® Platinum 8462Y+ processor (32C, 2.8GHz, 300W TDP), HT On, Turbo On, SNC OFF, Total Memory: 2 TB (16x128GB DDR5 IDPC 4800 MHz), BIOS: 3A11.uh, ucode: 0x2b000161, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi, 8.0.2, 22380479 vCenter 22385739, Horizon 8.11.0 2309 Build 22629772, Login Enterprise 5.7.2, Knowledge Worker profile vGPU Reference Workload + Zoom client on 96 users on CPU-only VMs, 2vCPU/8GB, EUX 8.5. Testing by The Futurum Group Dec 2023 through Feb 2024.

Config H2 – 4th Gen Intel® Xeon® Platinum Processor (32c), 96 users with Intel® Data Center GPU Flex 140 GPU-enabled VMs 4-node, Each node, Intel® Software Development Platform, 2x Intel® Xeon® Platinum 8462Y+ processor (32C, 2.8GHz, 300W TDP), HT On, Turbo On, SNC OFF, Total Memory: 2 TB (16x128GB DDR5 IDPC 4800 MHz), BIOS: 3A11.uh, ucode: 0x2b000161, Intel® Ethernet Network Adaptor E810-CQDA2 100G, 2 Groups; Per node cache tier: 2x 1.6TB P5800X Gen 4 SD 5800X, Per node capacity tier: 6x 3.84TB D7-P5510 Series, Gen4, ESXi 8.0.2, 22380479 vCenter 22385739, Horizon 8.11.0 2309 Build 22629772, Login Enterprise 5.7.2, Knowledge Worker profile vGPU Reference Workload + Zoom client on 96 users on GPU-enabled VMs, 2vCPU/8GB, EUX 8.5. Testing by The Futurum Group Dec 2023 through Feb 2024.

Performance varies by use, configuration, and other factors. Learn more at www.intel.com/PerformanceIndex.

Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See backup for configuration details. No product or component can be absolutely secure.

Your costs and results may vary. Intel technologies may require enabled hardware, software, or service activation.

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- Accenture Future of Work Study, April 2021: <https://www.accenture.com/us-en/insights/consulting/future-work>
 - IDC Future of Connectedness Forecast 2020-2024/via Khrisdigital.com: <https://khrisdigital.com/collaboration-statistics/>
 - <https://www.fortunebusinessinsights.com/virtual-desktop-infrastructure-market-107849>
 - <https://www.cio.com/article/191100/hci-and-vdi-built-to-support-remote-work-for-the-long-term.html>
 - <https://www.vmware.com/products/horizon.html>
 - Intel® Xeon® 8462Y CPU versus Intel® Xeon® 8358 CPU versus AMD 9354 CPU. See configuration for details. Results may vary.
- Config H1 – 3rd Gen Intel® Xeon® Platinum Processor (32c), 830 users 4-node, Each node, Intel® Software Development Platform, 2x Intel® Xeon® Platinum 8358 processor (32C, 2.6GHz, 250W TDP), HT On, Turbo On, SNC OFF, Total Memory: 2 TB (32x64GB DDR4 2DPC 3200 MHz), ucode: 0x0d000375, Intel® Ethernet**