

# Citrix Virtual Apps and Desktops VDI with Lenovo ThinkAgile HX and ThinkSystem V3 Servers

## Solution Brief

### Meeting the Needs of the Mobile Workforce

Industries as diverse as healthcare, finance, government, retail, and education have the common requirement to support and secure a mobile workforce. Organizations often have a dispersed workforce using many PCs, laptops, and mobile devices distributed to field offices and remote locations. Virtual Desktop Infrastructure (VDI) is a powerful solution to meet the need for flexibility and global availability of compute resources, while managing data security and compliance on mobile devices.

Lenovo VDI Solutions for Citrix® Virtual Apps and Desktops help your organization meet these business requirements by centrally managing the desktop image within the corporate IT environment rather than at the remote worker or office location. With user data, user profiles, and application data files on centralized servers, data center security and manageability are extended down to the user resources. Users have anywhere, anytime, secure access to data and applications from any device, including tablets and smartphones.

### Delivering Secure Desktops While Cutting IT Costs

Citrix Virtual Apps and Desktops provides a modern platform for secure delivery and monitoring of virtual Windows and Linux desktops and apps across the hybrid cloud. Citrix Virtual Apps and Desktops deliver an immersive, feature-rich user experience for end users, allowing them to work anytime, anywhere, on any device. It supports a consistently rich end user experience for office workers, mobile workers, and even 3D developers across devices, locations, media, and connections.

Citrix Virtual Apps and Desktops supports one-to-many provisioning and streamlined management of images, apps, profiles, and policies for an agile, lightweight, modern approach that speeds, simplifies, and reduces costs. You can rapidly deploy full-featured, personalized virtual desktops and apps in seconds, retain user customization and persona from session to session, and leverage an agile provisioning approach to quickly roll out updates at the next login.

#### Highlights

- Delivers, protects, manages, and monitors virtual desktops and apps while providing end users access anytime, anywhere, across any device
- Enables a scalable solution for a few hundred to several thousand users to meet current and future needs
- Supports a wide variety of VDI usage models from typical office users all the way up to high-end 3D rendering power users

## Lenovo ThinkAgile V3 systems with 4th Gen Intel Xeon Scalable Processors

Lenovo ThinkAgile HX are hyperconverged systems virtualized with Nutanix Acropolis, providing a seamless solution to run Citrix Virtual App and Desktop VDI workloads. Lenovo ThinkSystem servers are bare-metal servers supporting either shared or local storage. Lenovo ThinkAgile systems use ThinkSystem servers as a base platform.

ThinkAgile HX systems arrive with the hardware configured, software installed, and the option of having Lenovo Professional Services to integrate it into your environment. Lenovo ThinkAgile HX Series are available as Integrated Systems or Certified Nodes. Both are factory integrated, pre-configured systems with Lenovo hardware, Nutanix software, and deployment services. Integrated systems provide a quick and convenient path to implement a hyperconverged solution powered by Nutanix and a single point of contact provided by Lenovo for purchasing, deploying, and supporting the solution. HX Certified Nodes come with optional Nutanix software and services.

Lenovo ThinkAgile HX V3 servers and ThinkSystem Series V3 servers powered by 4th Gen Intel® Xeon® Scalable processors provide excellent performance, bandwidth, and speed. Specifications include:

- Up to 60 cores and 120 threads
- Processor base frequencies of up to 3.7 GHz
- Up to 32 DDR5 memory DIMMs, 16 DIMMs per processor, supports 1 DIMM per channel operating at up to 4800 MT/s or supports 2 DIMMs per channel operating at up to 4400 MT/s
- Using 256GB 3DS RDIMMs, the server supports up to 8TB of system memory

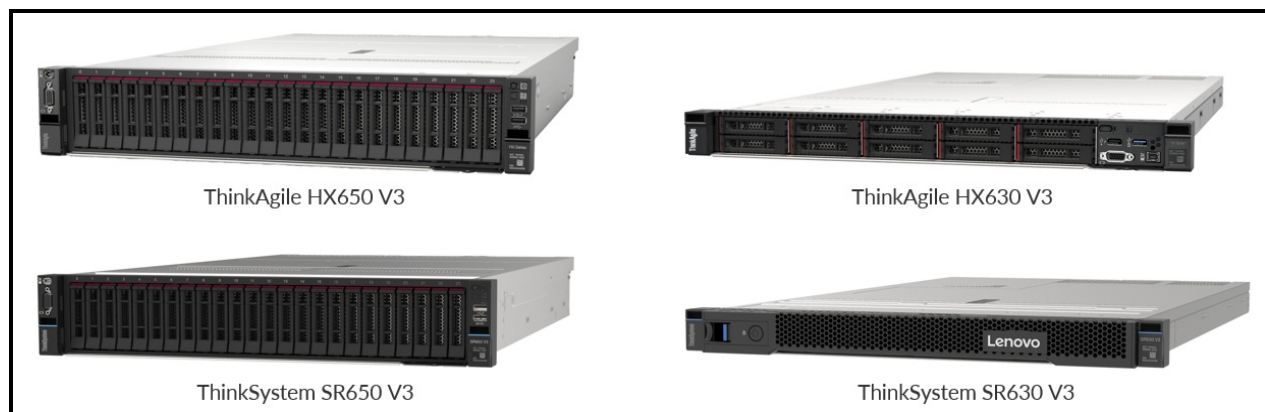


Figure 1. Lenovo ThinkAgile HX and ThinkSystem V3 Servers

Lenovo XClarity Administrator offers comprehensive hardware management tools that help to increase uptime, reduce costs, and improve productivity through advanced server management capabilities.

## Login Enterprise Testing Results

Login VSI's Login Enterprise VDI benchmark was performed for the knowledge worker profile with different login intervals on a four-node Lenovo ThinkSystem HX650 V3 cluster with two different 4th Gen Intel Xeon Scalable processors. The benchmark calculates an EUX (End User Experience) score, a rating that represents the performance of a Windows machine on a scale from 0 to 10, with a higher score representing a better user experience. The EUX score drops as more users are added and the load on the platform increases. The benchmark also stresses the system to 100% CPU utilization and provides a VSIMax score based on the login time and application response time criteria, with a higher VSIMax score indicating more concurrent active sessions are supported at a given EUX score.

## Login Enterprise Results with Microsoft Office 2019

The testing was performed by Intel on June 12, 2024, using the following software and hardware configurations and settings.

- Login Enterprise 5.8.5
- Citrix Virtual Apps and Desktops 7 2308
- Microsoft Windows 10 Version 22H2 build 19045.4291
- Microsoft Office Professional Plus 2019, Microsoft Edge
- Per user VDI/VM configuration - 2 VCPU + 2 GB Memory + 60 GB disk
- 2 VCPU + 2 GB Memory + 60 GB disk
- 2 VCPU + 4 GB Memory + 60 GB disk
- 4 VCPU + 4 GB Memory + 60 GB disk

Table 1. Test Hardware Configuration

Server	Lenovo ThinkAgile HX650 V3 CN
Processor	2x Intel Xeon Platinum 8462Y+ processors, 2x32C, 2.8 GHz 2 x Intel Xeon Platinum 8468 processors, 48C, 2.1 GHz
Microcode	0x2b000590
Memory	1024GB (16x ThinkSystem 64GB TruDDR5 4800MT/s (2Rx4) 10x4 [4800 MT/s])
NIC	2x ThinkSystem Mellanox ConnectX-6 Lx 10/25GbE SFP28 2-Port OCP Ethernet Adapter
Disk	2x ThinkSystem M.2 7450 PRO 960GB Read Intensive NVMe PCIe 4.0 x4 NHS SSD 8x ThinkSystem 2.5" U.3 7450 MAX 3.84 TB Read Intensive NVMe PCIe 4.0 x4 HS SSD
Hypervisor	Nutanix 6.5.5.5, AHV 20220304.480
Tuning	VMwareHorizonOSOptimizationTool-x86_64-1.2.2406.10224918368
CVM Config	22 VCPU + 64 GB Memory (Tests with Intel Xeon Platinum 8462Y+,32C) 32 VCPU + 64 GB Memory (Tests with Intel Xeon Platinum 8468, 48C)

Table 2 below shows VSIMax values for different test scenarios.

- Up to 300 knowledge workers can be hosted per node with 2 x Intel Xeon Platinum 8462Y+ 32C processors or 2 x Intel Xeon Platinum 8468 48C processors at 100% CPU utilization. In a typical deployment with 75%-80% CPU usage, ~200 desktops can be deployed, and the results show most of the Office applications' response times are well below 2 seconds for up to 900 users as shown in Figure 3.
- Figure 1 and 2 shows the EUX score is above 6 for up to 1050 users indicating the application response time is not impacted when CPU usage exceeds 85%. It shows that 4<sup>th</sup> Gen Intel Xeon processors can support more desktops with smaller headroom capacity to sustain peak and failover scenarios without compromising application performance.
- Testing with 12 logins per minute is comparable to peak load scenarios and increases application latency after CPU utilization reaches 90%. It shows that increasing the login rate reduces the VSIMax score due to increased application response time.
- Table 3 shows improved performance when using 4 GB memory and 4 VCPU configuration over tests with 2VCPU+ 2GB memory tests. The login time and office applications start time and processing time are improved when using 4GB memory. The recommended minimum

memory configuration for office applications is 4GB and it has to be sized based on the expected user experience and other applications running on the virtual desktop. The 4 VCPU tests shows slightly better performance than 2 VCPU but 4 VCPU is over sized configuration for knowledge worker profile used in the testing.

- More user density can be achieved by leveraging Intel Xeon processors with higher core count and the application response time varies based on clock speed.

Table 2: VSIMax for knowledge workers with Microsoft Office 2019

<b>VM Configuration</b>	<b>Login Interval</b>	<b>VSIMax @ 100% CPU (4 Node ThinkSystem HX650 V3 IS)</b>	<b>VSIMax @100% CPU (Single Node)</b>
2 VCPU + 2 GB Memory+60GB disk	2 user per minute per node	1196	299
2 VCPU + 2 GB Memory+60GB disk	12 user per minute per node	>824	~206

Table 3: VSIMax for knowledge workers with Microsoft Office 2019 with Intel Xeon Platinum 8468 48C

<b>VM Configuration</b>	<b>Login Interval</b>	<b>VSIMax @ 100% CPU (4 Node ThinkSystem HX650 V3 IS)</b>	<b>VSIMax @100% CPU (Single Node)</b>
2 VCPU + 2 GB Memory+60GB disk	2 user per minute per node	1349	~337
2 VCPU + 2 GB Memory+60GB disk	12 user per minute per node	821	~205
2 VCPU + 4 GB Memory+60GB disk	12 user per minute per node	847	212
4 VCPU+4 GB Memory+60GB disk	12 user per minute per node	906	~226

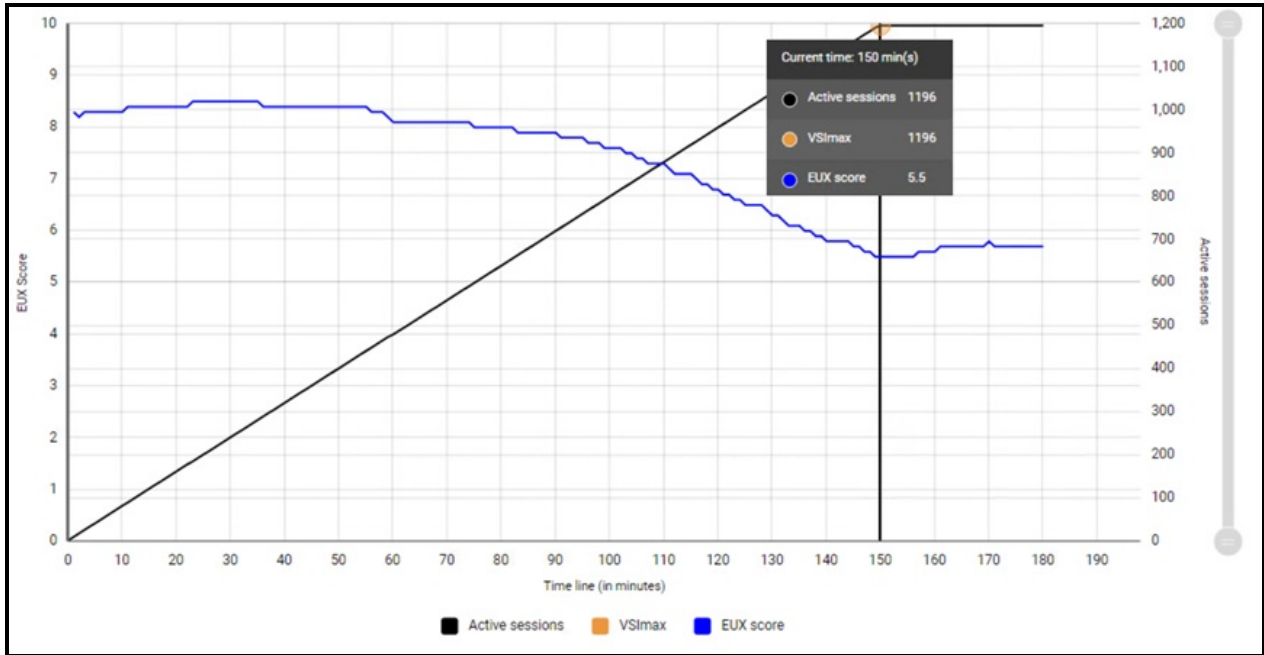


Figure 2. Login Enterprise EUX Score on 4 Node ThinkAgile HX650 V3 servers with 4th Gen Intel Xeon CPUs

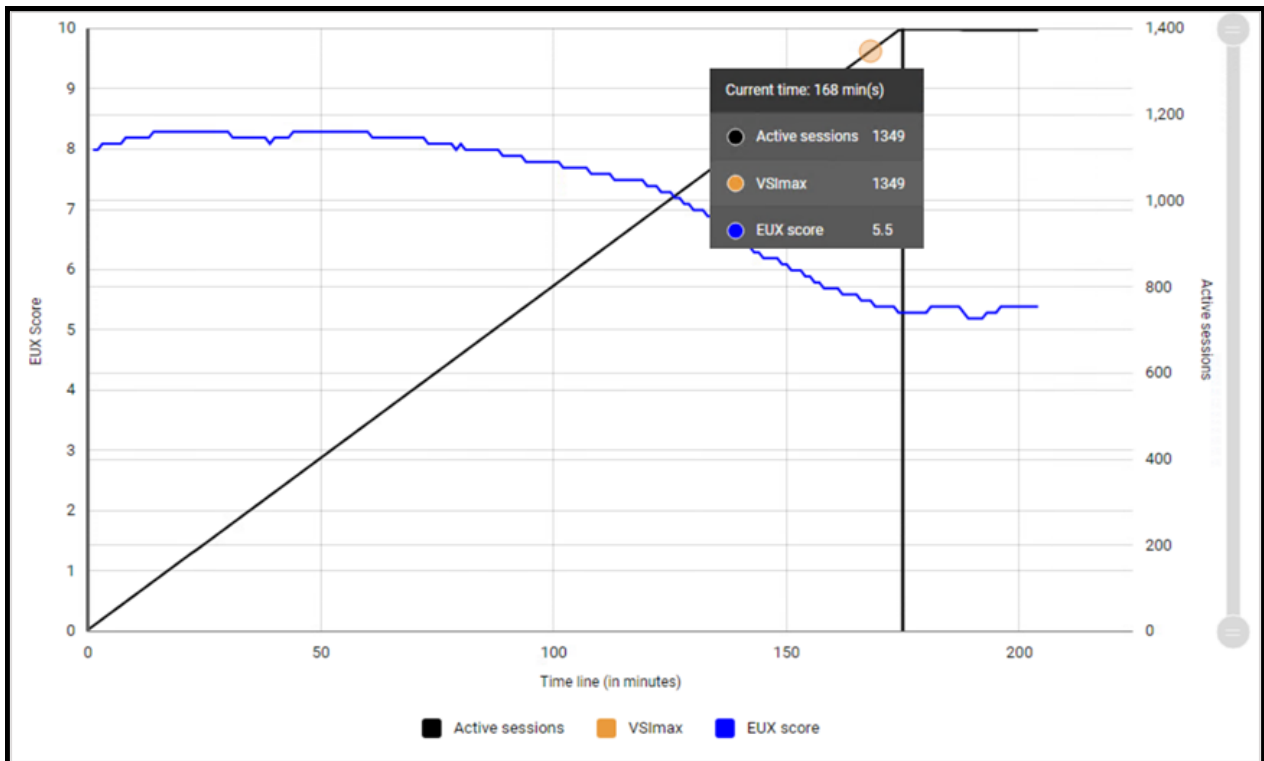


Figure 3. Login Enterprise EUX Score on 4 Node ThinkAgile HX650 V3 servers with Intel Xeon Platinum 8468 48C

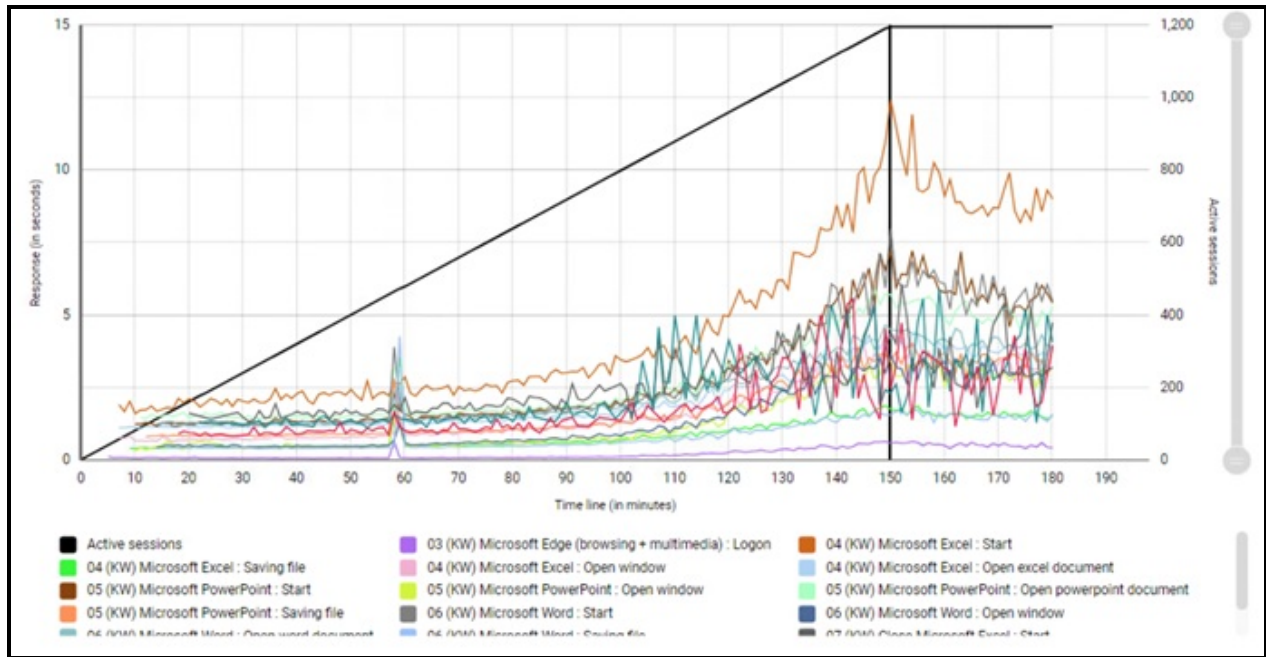


Figure 4. Office 2019 applications' response times – 4th Gen Intel Xeon CPUs

### Login and Application Performance with Varying Memory Configuration

Figure 4 shows login performance for virtual desktop with 2 VCPU + 2 GB memory (dotted line) and 2 VCPU + 4 GB memory (solid line). The login performance is better with 4 GB memory configuration.

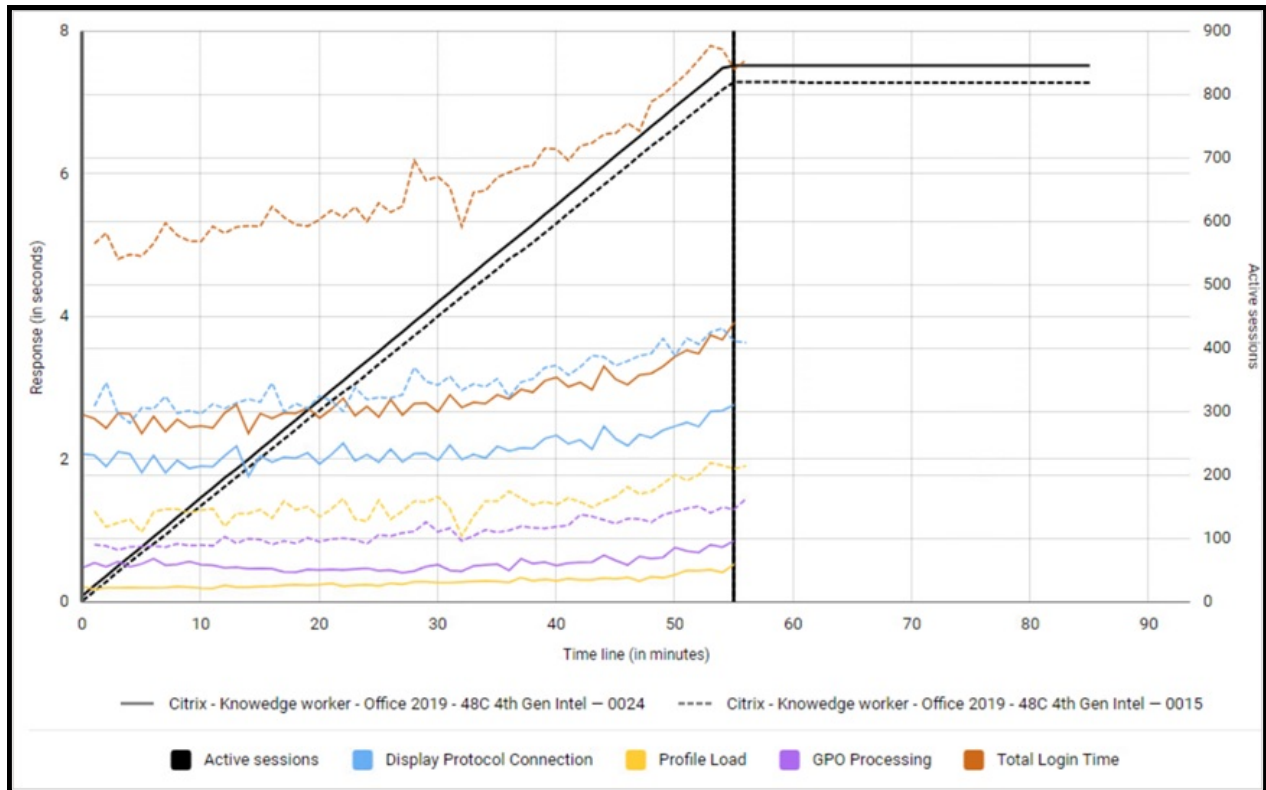


Figure 5. Windows 10 Enterprise Login performance with 2GB and 4GB memory on Intel Xeon 4th Gen Processors

Figure 5 shows start time performance of some of the Microsoft 365 applications on virtual desktops with 2 VCPU + 2 GB memory(dotted line) and 2 VCPU + 4 GB memory(solid line). The application performance is better with 4GB memory configuration. It is recommended to validate memory requirements for individual applications and size virtual desktop memory accordingly.

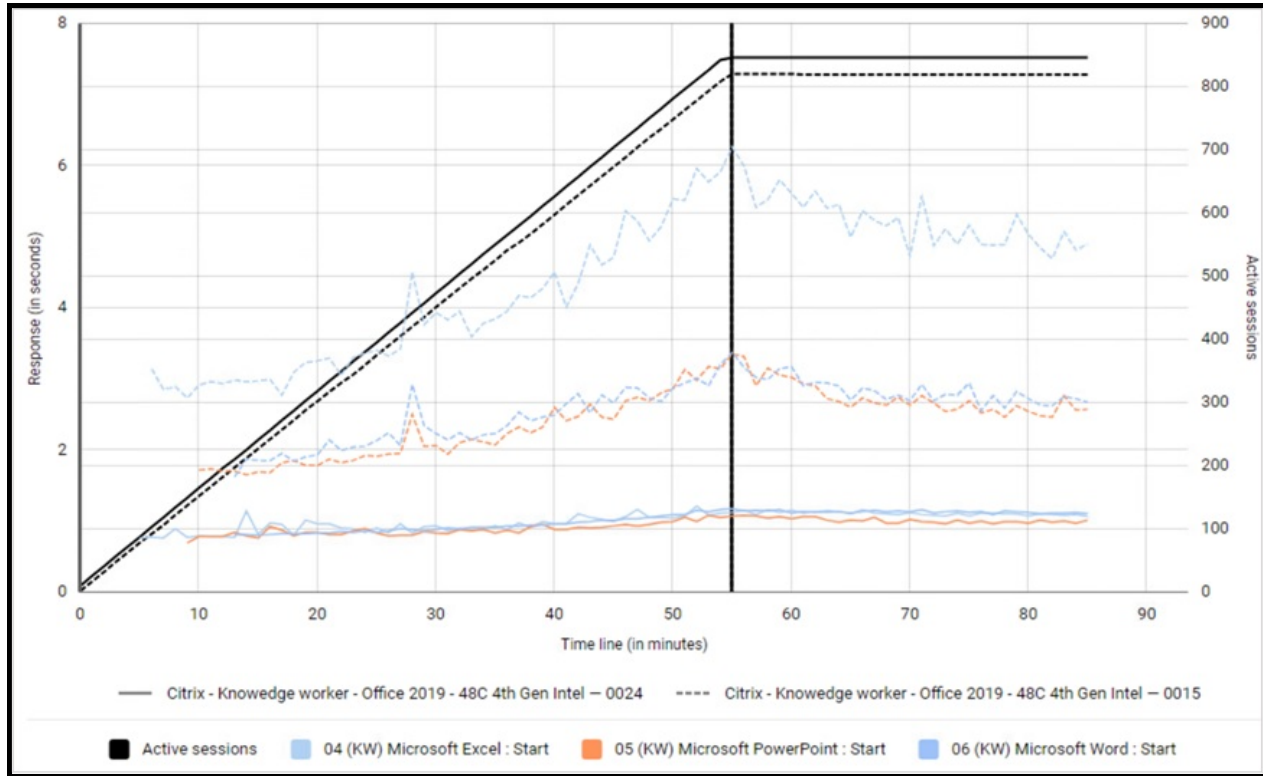


Figure 6. Microsoft 365 Applications Start time performance with 2GB and 4GB memory on Intel Xeon 4th Gen Processors

## End-to-End VDI Solution

From devices to desktops, Lenovo helps businesses access the data needed to make informed decisions. Lenovo offers a wide range of PCs, tablets, thin clients, and smartphones for end-user access. The portability, versatility, and lightweight features of Lenovo thin clients allow for deployment across the organization, especially where space is at a premium.

## For More Information

To learn more about Lenovo workload solutions on ThinkSystem SR650 V3 and SR630 V3, ThinkAgile HX630 V3 and HX 650 V3, contact your Lenovo Business Partner or visit: <https://www.lenovo.com/systems/solutions>

### References:

[Lenovo ThinkAgile HX650 V3 2U Integrated System and Certified Nodes](#)

[Lenovo ThinkAgile HX630 V3 1U Integrated Systems and Certified Nodes](#)

[Lenovo ThinkSystem SR650 V3 Server Product Guide](#)

[Lenovo ThinkSystem SR630 V3 Server Product Guide](#)

## Disclaimers

Performance varies by use, configuration, and other factors. Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. No product or component can be absolutely secure. Your costs and results may vary. Intel technologies may require enabled hardware, software, or service activation.



## Related product families

Product families related to this document are the following:

- [Citrix Virtual Apps](#)
- [Nutanix Alliance](#)
- [ThinkAgile HX Series for Nutanix](#)
- [ThinkSystem SR630 V3 Server](#)
- [ThinkSystem SR650 V3 Server](#)

## Notices

Lenovo may not offer the products, services, or features discussed in this document in all countries. Consult your local Lenovo representative for information on the products and services currently available in your area. Any reference to a Lenovo product, program, or service is not intended to state or imply that only that Lenovo product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any Lenovo intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any other product, program, or service. Lenovo may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

Lenovo (United States), Inc.  
8001 Development Drive  
Morrisville, NC 27560  
U.S.A.  
Attention: Lenovo Director of Licensing

LENOVO PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. Lenovo may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

The products described in this document are not intended for use in implantation or other life support applications where malfunction may result in injury or death to persons. The information contained in this document does not affect or change Lenovo product specifications or warranties. Nothing in this document shall operate as an express or implied license or indemnity under the intellectual property rights of Lenovo or third parties. All information contained in this document was obtained in specific environments and is presented as an illustration. The result obtained in other operating environments may vary. Lenovo may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Any references in this publication to non-Lenovo Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this Lenovo product, and use of those Web sites is at your own risk. Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

© Copyright Lenovo 2024. All rights reserved.

This document, LP1993, was created or updated on July 19, 2024.

Send us your comments in one of the following ways:

- Use the online Contact us review form found at:  
<https://lenovopress.lenovo.com/LP1993>
- Send your comments in an e-mail to:  
[comments@lenovopress.com](mailto:comments@lenovopress.com)

This document is available online at <https://lenovopress.lenovo.com/LP1993>.

## Trademarks

Lenovo and the Lenovo logo are trademarks or registered trademarks of Lenovo in the United States, other countries, or both. A current list of Lenovo trademarks is available on the Web at <https://www.lenovo.com/us/en/legal/copytrade/>.

The following terms are trademarks of Lenovo in the United States, other countries, or both:

Lenovo®

ThinkAgile®

ThinkSystem®

XClarity®

The following terms are trademarks of other companies:

Intel® and Xeon® are trademarks of Intel Corporation or its subsidiaries.

Linux® is the trademark of Linus Torvalds in the U.S. and other countries.

Microsoft®, Microsoft Edge, and Windows® are trademarks of Microsoft Corporation in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.