UNLOCKING THE PERFORMANCE OF AZURE VIRTUAL DESKTOP FOR AZURE LOCAL WITH AMD EPYC™ USING LOGIN ENTERPRISE

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Virtual desktop infrastructure (VDI) has become a cornerstone of modern enterprise IT, delivering flexibility, security, and centralized management for remote workforces. With the recent evolution of Microsoft Azure Stack HCI into **Microsoft Azure Local**, this platform is now poised to revolutionize VDI scalability and performance—especially when paired with cutting-edge hardware and advanced testing methodologies.

Over the past several months, AMD, Microsoft, and Login VSI have collaborated to evaluate the performance of **Azure Virtual Desktop (AVD)** for Azure Local using both the AMD EPYC 9004 series processor, codenamed Genoa, and the AMD EPYC 8004 series processor, codenamed Siena. Detailed results from our testing with AMD EPYC 9004 series processors can be found here.

This blog dives into the AMD EPYC 8004 series processor results, showcasing its performance on the **Lenovo ThinkAgile MX455 server**—a single-socket, 1U platform that's one of the premier offerings in the Microsoft Azure Local catalog. Using the Login Enterprise benchmark, we explored how this VDI solution delivers impressive performance and an excellent user experience.

A FOUNDATION FOR SCALABLE VDI SOLUTIONS

Azure Local represents a leap forward in hybrid cloud infrastructure, offering organizations a consistent Azure experience across on-premises and cloud environments. When deployed with AMD's EPYC processors, Azure Local demonstrates extraordinary scalability and performance, making it an ideal platform for hosting Azure Virtual Desktop environments.

Our testing highlighted several key benefits:

Unparalleled Scalability: The high core count and advanced architecture of AMD EPYC™ processors allow Azure Local to support a significantly higher number of virtual desktops per host compared to traditional setups.

Superior Performance: Latency-sensitive applications and high-demand Knowledge Worker workloads performed seamlessly, even under heavy user loads.

Cost Efficiency: By maximizing resource utilization and leveraging modern memory and compute technologies, organizations can achieve high performance at a lower total cost of ownership (TCO).

AZURE LOCAL SOLUTIONS

Azure Local solutions come in three tiers– Premier Solutions, Integrated Systems, and Validated Nodes –each catering to different deployment needs and enterprise requirements.

Premier Solutions: These represent the highest level of integration and support, offering advanced features, premium hardware options, and dedicated vendor assistance. Premier solutions are ideal for enterprises with complex workloads and stringent performance or compliance needs.

Integrated Systems: These are tightly coupled hardware and software stacks from select vendors, designed for seamless deployment and optimized for Azure Local workloads. They provide a closer plug-and-play experience, ensuring quick time-to-value.

Validated Nodes: Validated Nodes include a broader range of hardware configurations tested to meet Azure Local requirements. These provide flexibility for organizations that want to select hardware that best aligns with their existing IT infrastructure while ensuring compatibility and performance.

NOTE: Understanding these tiers enables businesses to choose the Azure Local solution that best fits with their specific use case, ensuring both operational efficiency and scalability. Since performance is at the root of a great user experience and high productivity, it's important to understand the performance of the chosen solution. As you discover new solutions for your enterprise, it is important to understand how to optimize system performance. Additionally, thoroughly testing the solution before implementing any changes in a production environment is key to ensuring its effectiveness.

INITIAL RESULTS: A GAME-CHANGER FOR VDI

The initial test results reveal that AMD EPYC and Azure Local deliver exceptional performance for Azure Virtual Desktop workloads. The AMD EPYC Processor 8004 Series (codenamed Siena) consistently maintained low latency and high throughput, even during stress tests that simulated peak usage scenarios. These findings underscore the viability of Azure Local with AMD as a robust, enterprise-ready platform for hosting virtual desktops.

The following tables show the hardware and software configuration used for testing the solution.

COMPONENT	DESCRIPTION
Server	Two node **Lenovo ThinkAgile MX455 V3 Edge Solution**
Processor	**AMD EPYC™ 8543P 64-Core Processor**
Memory	6 * 96GB DDR5 DIMMS @ 4800MHz
OS Drive	2 * 960GB NVMe SSD
Storage	4 * 3.84TB NVMe SSD
Network Adapters	Mellanox ConnectX-6 Lx 10/25GbE SFP28 2-port OCP Ethernet Adapter Mellanox ConnectX-6 Lx 10/25GbE SFP28 2-port PCIe Ethernet Adapter

Table 1: Hardware Configuration

COMPONENT	DESCRIPTION
Host Operating System	Azure Stack HCI OS 10.0.25398.1189
Hypervisor	Microsoft Hyper-V
Guest Operating System	Windows 10 Build 19045.5073
Login Enterprise	5.12.3

Table 2: Software Configuration

Key metrics from the tests include:

User Density: The platform supported significantly higher numbers of concurrent users per node compared to other industry benchmarks.

Workspace Responsiveness: End-user applications launched quickly and ran smoothly, even with resource-intensive tasks.

Resource Utilization: CPU and memory utilization remained balanced, avoiding bottlenecks and ensuring consistent performance.

SOLUTION ARCHITECTURE

The success of Azure Virtual Desktop on Azure Local is underpinned by an architecture that integrates key technologies:

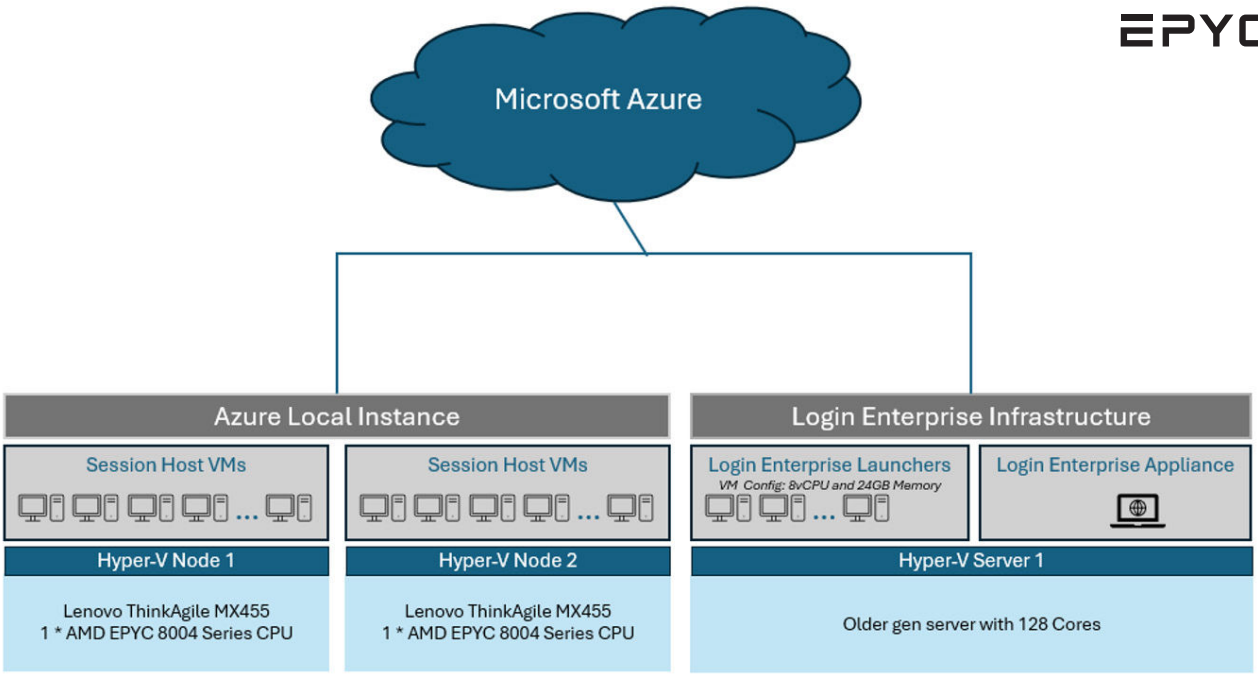

Figure 1 - Azure Local Infrastructure Diagram

Azure Arc: Azure Arc extends Azure management and services to on-premises environments. It provides unified operations across hybrid and multi-cloud environments, ensuring that Azure Local deployments benefit from the same monitoring, governance, and automation as native Azure workloads. Azure Arc is configured on the Azure Local host while deploying the Azure Local Instance. Workloads running on Azure Local, like VMs and Azure Kubernetes Servers (AKS), can also be managed and monitored from Azure portal as native Azure workloads.

FSLogix: This profile management tool optimizes the end-user experience in virtual desktop environments by enabling fast and efficient access to user profiles and settings. FSLogix reduces logon times and ensures seamless application performance, even in high-density deployments. In our testing the user profiles are managed by FSLogix and are mounted via SMB Share.

Hyper-V: As the foundational hypervisor for Azure Local, Hyper-V ensures robust virtualization performance and resource allocation. Its proven scalability and reliability make it a critical component of the solution, enabling efficient hosting of virtual machines and Azure Virtual Desktop workloads.

By leveraging these technologies, Azure Local delivers a seamless, high-performance platform for hosting Azure Virtual Desktop, ensuring that enterprises can deploy and manage their VDI environments with confidence.

TESTING METHODOLOGY AND ITS IMPORTANCE

The performance evaluation of Azure Virtual Desktop for Azure Local was conducted using a systematic testing methodology. AMD utilized Login Enterprise by **Login VSI** to simulate real-world workloads, replicating diverse user scenarios and application demands. This testing process involved:

Workload Simulation: Creating virtual desktop user scenarios with varying levels of complexity and resource usage to test the platform's scalability and resilience.

Stress Testing: Pushing the infrastructure to its limits to identify performance bottlenecks and validate system stability under peak loads.

Detailed Metrics Collection: Monitoring key performance indicators such as CPU utilization, memory usage, application response times, and user density.

This rigorous testing process is essential for several reasons:

Validation of Scalability: It ensures the solution can handle large-scale deployments while maintaining optimal performance.

Predictable Performance: Testing under controlled conditions allows organizations to predict how the solution will perform in their specific environments.

Optimized Resource Utilization: Identifying optimal configurations ensures that enterprises can maximize ROI while delivering excellent end-user experiences.

By taking this comprehensive approach, we've been able to demonstrate the robust capabilities of Azure Local for VDI workloads, providing confidence to organizations considering this innovative solution.

The Role of Login Enterprise

At the heart of our testing methodology is **Login VSI's Login Enterprise**, a comprehensive solution for automated performance testing and benchmarking in VDI environments. AMD used Login Enterprise to simulate real-world user workloads, measuring system responsiveness, application performance, and infrastructure scalability under varying conditions. This rigorous approach provided actionable insights into the performance capabilities of Azure Local powered by AMD processors.

Login Enterprise Workload

The workload used in this testing is the Login Enterprise **Knowledge Worker** which is a medium to heavy duty productivity user that regularly uses a web browser, an email client, and specializes in a wide range of software to create spreadsheets, documents and presentations. It is common for Knowledge Workers to have multiple applications and browsers open at once, regularly switching between these applications. The Knowledge Worker expects a responsive user experience and has little tolerance for variation in performance. This Knowledge Worker mostly aligns to the heavy user profile noted by Microsoft® in the following article.

TEST RESULTS: TWO-NODE CLUSTER PERFORMANCE ANALYSIS

To assess the performance of a two-node Azure Local instance, we ran the Login Enterprise benchmark with the industry-standard Knowledge Worker workload to simulate the user load on the system. A host pool is a collection of Azure virtual machines deployed on an Azure Local instance. The process for configuring and deploying the host pool is discussed in this tuning guide. The session hosts were running Windows 10 Enterprise Multi-session Build 10.0.19045.5073 and Microsoft Office 365 applications. The session host configuration used for the tests included 16 vCPUs and 64GB memory. To determine the optimal number of session hosts (SH) on a two-node instance, we tested various session host counts including 12 SH, 13 SH, 14 SH and 15 SH.

During the login phase, 250 users logged in with an average of 8 virtual users accessing the session host pool per minute. Once all the users have logged in, the Knowledge Worker workload was run for approximately 30 minutes. It is important to note that a VSImax was achieved during all the runs.

Across all session host configurations, we observed consistent performance, demonstrating good scalability. The 12-session host configuration with 16 vCPUs and 64GB of memory appears to be the ideal setup, providing room for users who may over-utilize resources or allowing a few additional users to log on. Since the capacity of this cluster was 250 sessions, regardless of the number of session hosts, going with the 12-session host configuration reduces management and complexity.

Performance Metrics:

EUX Baseline Score: 8.2 (calculated from the best-performing 5 minutes when the system was idle).

Steady-State Score: 6.9 (average score recorded after all sessions were active).

VSImax: 247 (maximum number of virtual user sessions a VDI environment can handle before performance degradation.)

Figure 2 - EUX Scores for different numbers of Session Host configurations had similar performance

Key Findings:

Stable Performance: The system maintained similar application responsiveness and user density metrics across all three configurations, highlighting the platform's ability to handle varying workloads without performance degradation.

Efficient Resource Utilization: Even as the number of session hosts increased, CPU and memory utilization remained balanced, ensuring consistent performance for end-users.

Robust Scalability: These results prove that the AMD Sienna processors provide a dependable foundation for scaling AVD deployments on Azure Local, making it an ideal choice for enterprises with dynamic workload requirements.

This analysis underscores the flexibility and reliability of Azure Local when paired with AMD's advanced processor technology, delivering a performance solution that meets the demands of modern VDI environments.

CPU and Memory Utilization:

The graphs below show the average CPU and memory utilization for the sessions hosts during a test run with 12, 13, 14 and 15 session hosts on a two-node Azure local instance running the Login Enterprise Knowledge Worker. CPU and memory utilization across all the session hosts sizes remained within a similar range, with a variation of approximately 10%.

VSImax was triggered at 250 users for all session host combinations, indicating the maximum user capacity of the system. Although the CPU and memory utilization did not reach their peak for the session hosts, the test still triggered VSImax at 250 users, likely due to the Hyper-V host reaching its resource limits. This was done to ensure optimal end user experience for the users.
Since all the session hosts provide similar VSImax, using 12 session hosts is recommended for easier session host management.

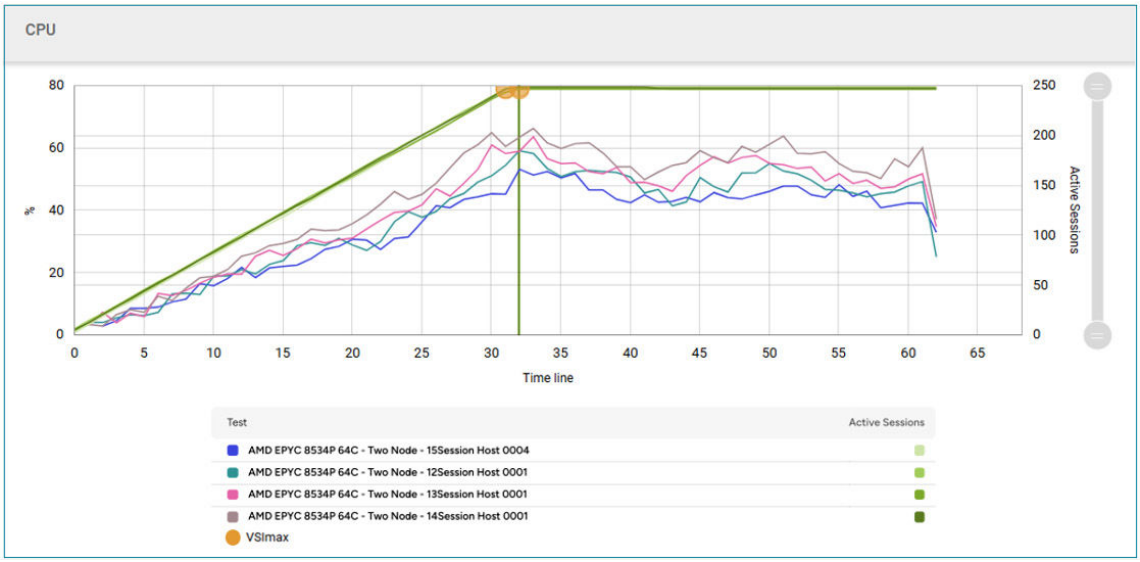

Figure 3 – Average CPU Utilization of Session Host VMs on Two node EPYC™ Azure Local Instance

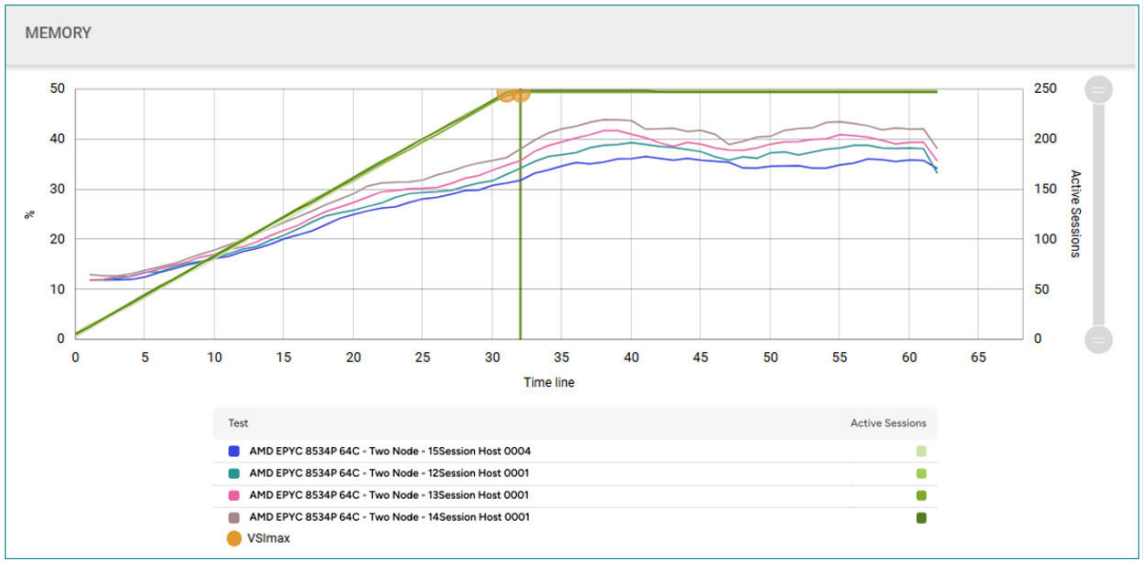

Figure 4 - Average Memory Utilization of Session Host VMs on Two node EPYC™ Azure Local Instance

Azure Monitor Insights

Azure Monitor when enabled and deployed on the session hosts provides insights on connection diagnostics, session host performance, health, utilization and user activity. This can be useful to identify potential bottlenecks on the session hosts.

Login storm testing was conducted to see how AVD on Azure local performed. We relied heavily on Azure Monitor to provide insights into the users' login and connection experiences. Azure Monitor offers performance metrics for all stages of the login experience, from making the connection from the Remote Desktop Client through the AVD broker, to each phase of the Windows desktop login experience. This proved to be very valuable when troubleshooting the login experience using Azure Monitor.

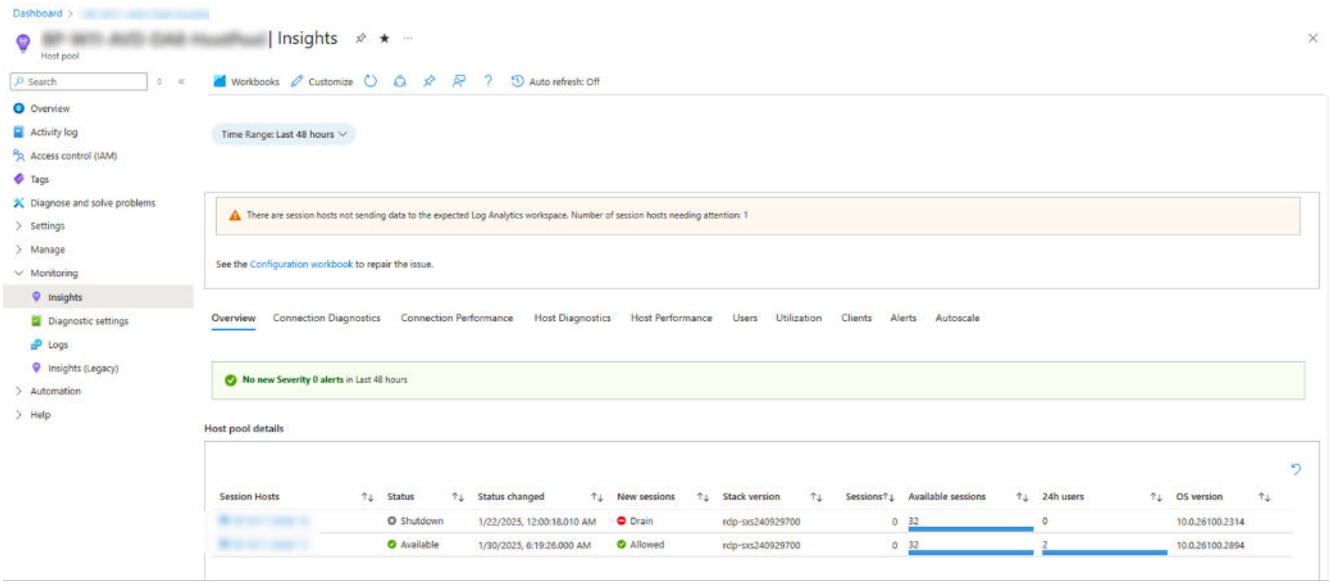

Figure 5 - Azure Monitor with AVD Insights

Below you will find some of the Connection Performance information that was used during this testing.

Connection Performance Overview: The graphs display the connection performance of 250 users accessing 12 session hosts on an Azure Local Instance. The connection time is broken down by stages during the authentication process, offering insights into each step. In the example below we can see what the nominal connection times were for the users over hour during the test. When experiencing **black screen issues** during testing we could see that p95(Sum) Shell Ready took approximately 9 minutes.

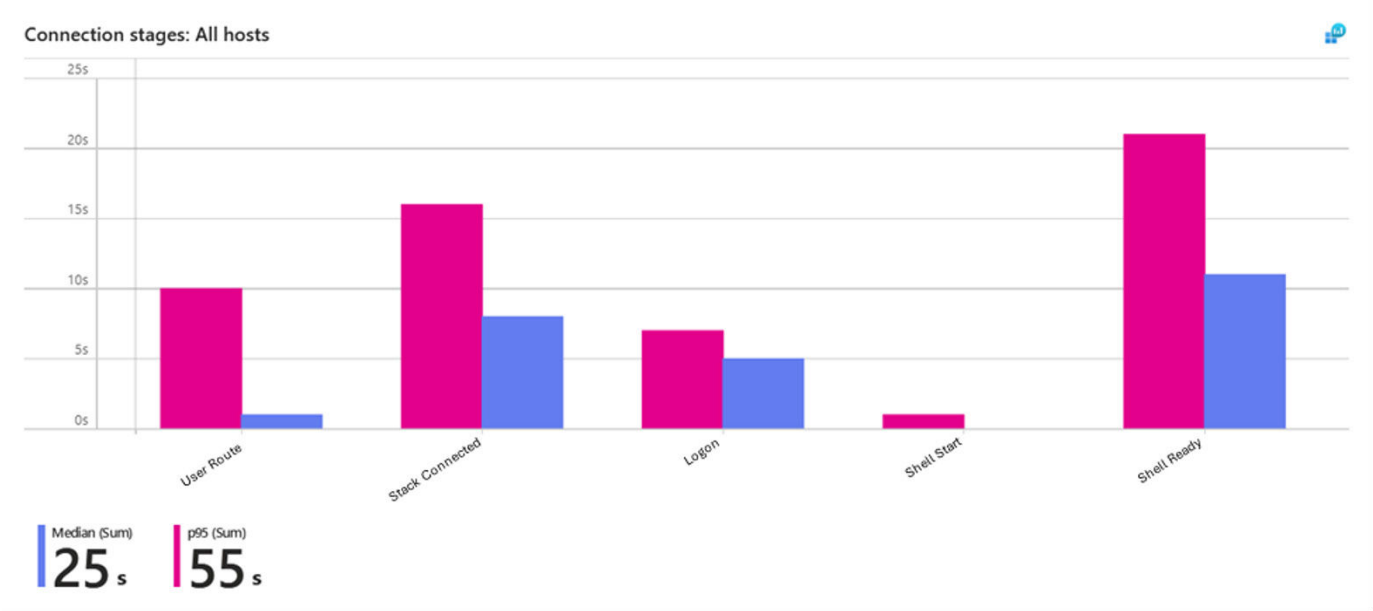

Figure 6 - Connection Stages in Azure Insights

Post-Authentication Stages: The below graph outlines the stages following successful user-authentication, with a key focus on the time taken to load a user profile for FSLogix. This helps in diagnosing potential performance issues. The following example below presents the nominal Winlogon times recorded for users over an hour during the test.

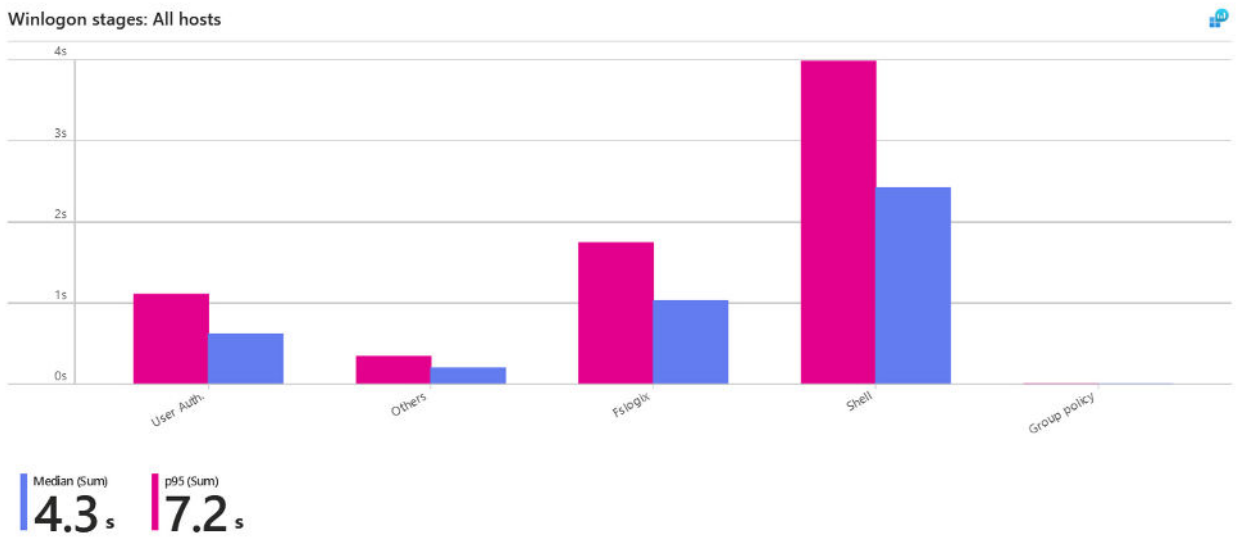

Figure 7 - Winlogon Stages in Azure Insights

User Connection Time: This table outlines the time taken for users to connect to the session host, specifically for 250 users. It provides insights into the median and maximum connection times. In our testing we measured an average of less than one minute for all the user logins on the session hosts. However, when the black screen issue occurred, the median connection times increased, reaching up to an hour.

Top 10 hosts with highest median time to connect

Host	Connections	Users	Median	p95
qarthwin10-9	18	18	32s	49s
qarthwin10-12	19	19	32s	45s
qarthwin10-15	19	19	31s	44s
qarthwin10-11	18	18	32s	44s
qarthwin10-0	18	18	27s	41s
qarthwin10-10	18	18	30s	40s
qarthwin10-17	16	16	27s	40s
qarthwin10-1	18	18	24s	40s
qarthwin10-16	17	17	29s	39s
qarthwin10-2	16	16	26s	36s

Figure 8 - Top 10 session hosts with highest time to connect

RESULTS: A GAME-CHANGER FOR VDI

The initial test results reveal that Azure Local delivers exceptional performance for Azure Virtual Desktop workloads. The EPYC™ 9004 and 8004 series processors consistently maintained low latency and high throughput, even during stress tests that simulated peak usage scenarios. These findings underscore the viability of Azure Local as a robust, enterprise-ready platform for hosting virtual desktops.

THE FUTURE OF VDI ON AMD EPYC AND AZURE LOCAL

These initial results mark the beginning of an exciting new chapter for VDI. With the combination of Azure Local's hybrid cloud capabilities, AMD's processor technology, and Login Enterprise's testing expertise, enterprises can confidently deploy scalable, high-performance virtual desktop solutions tailored to their unique needs.

Stay tuned for more insights and detailed results as we continue to push the boundaries of what's possible with VDI on Azure Local. Together with our partners at Microsoft and Login VSI, we're setting a new standard for virtual desktop performance and scalability—and we're just getting started.

DISCLAIMERS

These results are for reference only, as performance may vary depending on the server, processor, session host image, installed software packages and other influencing factors. We strongly recommend conducting your own testing before making a purchase decision. Reach out to us for assistance.

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