



# Reference Architecture: Azure Virtual Desktop on Azure Stack HCI 23H2 on Lenovo MX650V3

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Version 1.0

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On-Premises VDI, Powered by  
the Cloud

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Lenovo SR650V3: High-  
Performance Foundation

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Simplified Management with  
Azure Portal

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Secure, Scalable,  
and Cost-Effective

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# 1 Introducing Azure Virtual Desktop on Azure Stack HCI: Powered by Lenovo SR650V3

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## 1.1 Lenovo SR650V3: The Foundation for On-Premises VDI

The Lenovo ThinkSystem SR650 V3 server serves as the robust hardware platform for this Reference Architecture. This high-performance, scalable server provides the compute, storage, and networking capabilities essential for hosting your on-premises virtual desktop infrastructure (VDI) powered by Azure Virtual Desktop (AVD) and Azure Stack HCI.

## 1.2 Azure Virtual Desktop: Virtual Desktops, Reimagined

Azure Virtual Desktop (AVD) stands as a powerful VDI Solution for desktop and application virtualization, delivering Windows desktops and applications seamlessly to any device, from anywhere. With AVD, your users gain access to their personalized workspaces, fostering productivity and flexibility, regardless of their physical location. AVD caters to diverse needs, supporting traditional Windows 10 and Windows 11 desktops, with the added advantage of Windows Multi-session.

**Windows 10 and Windows 11 Multi-session:** This unique capability maximizes resource efficiency by enabling multiple users to concurrently share a single Windows virtual machine, further enhancing the value of your Lenovo SR650V3 investment.

## 1.3 AVD: The Advantages

- **Agility and Scalability:** AVD's cloud-inspired architecture allows you to scale your virtual desktop infrastructure effortlessly, adapting to changing demands while optimizing costs.
- **Fortified Security:** Your sensitive data and applications remain within your secure on-premises environment with AVD on Azure Stack HCI, offering enhanced control and protection.
- **Simplified Management:** AVD streamlines the management of your on-premises virtual desktops. Centralized control simplifies deployment, updates, and oversight, freeing up your IT resources.
- **Elevated User Experience:** AVD delivers a consistent and familiar desktop experience across devices, empowering users to work seamlessly and efficiently, regardless of location.

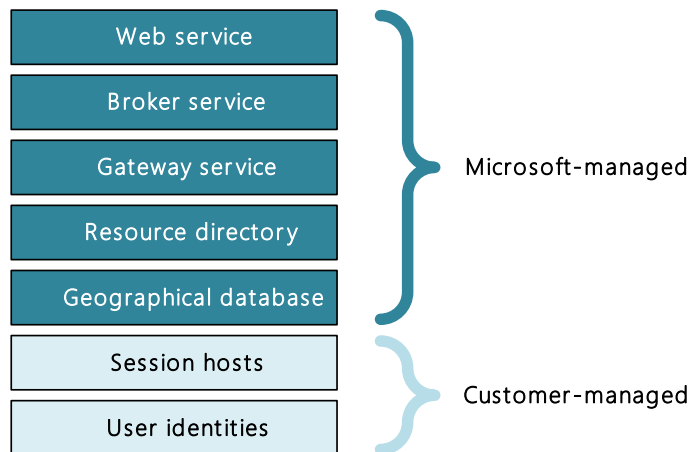


Figure 1 AVD high-level diagram

## 1.4 Azure Stack HCI: Azure in Your Datacenter, Optimized for Lenovo SR650V3

Azure Stack HCI extends the power of Azure into your own datacenter, seamlessly integrating with the Lenovo SR650V3. This hyperconverged infrastructure (HCI) solution combines compute, storage, and networking, simplifying the deployment and management of your on-premises virtualized environment, specifically tailored to the capabilities of the Lenovo SR650V3

## 1.5 The Power of AVD on Azure Stack HCI with Lenovo SR650V3: On-Premises VDI, Elevated with Hybrid Benefits

- **On-Premises Control, Cloud Flexibility:** AVD on Azure Stack HCI, running on the Lenovo SR650V3, empowers you to maintain full control over your data and workloads within your own datacenter, while still benefiting from cloud-like flexibility and scalability.
- **Cost-Effectiveness:** This solution enables cost optimization by leveraging the powerful Lenovo SR650V3 hardware, reducing the reliance on additional infrastructure and software licenses.
- **Performance and Resilience:** The combination of Azure Stack HCI and Lenovo SR650V3 ensures high performance and reliability for your on-premises virtual desktops, guaranteeing responsive and always-available workspaces.
- **Enhanced Security and Compliance:** Retain complete control over your data and ensure adherence to regulatory requirements with this on-premises solution, essential for organizations navigating stringent compliance landscapes.
- **Hybrid Cloud Integration:** Seamlessly integrate your on-premises AVD environment with Azure for additional capabilities like backup, disaster recovery, and cloud bursting, extending the value of your

Lenovo SR650V3 investment.

## 1.6 Use Cases: AVD on Azure Stack HCI with Lenovo SR650V3 for On-Premises VDI

- **Secure Remote Access:** Provide secure and productive remote access to on-premises desktops and apps, empowering your workforce to thrive in any location.
- **Branch Office Efficiency:** Deliver a standardized desktop experience to branch offices, simplifying IT operations and reducing costs, all while keeping data on-premises.
- **Agile Workspaces:** Rapidly provision on-premises virtual desktops for contractors, temporary staff, or project-based needs, leveraging the scalability of the Lenovo SR650V3.
- **Specialized Workloads:** Cater to specialized on-premises workloads with unique hardware or software requirements, harnessing the performance capabilities of the Lenovo SR650V3.

## 2 Architecture of AVD on Azure Stack HCI with Lenovo SR650V3

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### 2.1 Functional prerequisites

The core of this architecture lies in the synergy between the robust Lenovo SR650V3 server, the Azure Stack HCI hyperconverged infrastructure, and the Azure Virtual Desktop service. This combination delivers a powerful, secure, and scalable on-premises VDI solution.

Key Components and Interactions:

- **Lenovo ThinkSystem SR650 V3:** This server acts as the physical foundation, housing the compute, storage, and networking resources necessary to support the virtualized environment. Its high performance and scalability ensure optimal virtual desktop delivery.
  - **Azure Stack HCI:** Deployed on the Lenovo SR650V3, Azure Stack HCI provides the hyperconverged infrastructure, streamlining the management and deployment of virtual machines (VMs) that host the virtual desktops.
  - **Azure Virtual Desktop:** This cloud-based service orchestrates the delivery of virtual desktops and applications to end-users, regardless of their device or location.
  - **Hyper-V Virtual Machines:** These virtualized instances, residing on Azure Stack HCI, host the individual or multi-sessions virtual desktops for users.
  - **Remote Desktop Clients:** End-users access their virtual desktops through Remote Desktop clients installed on their devices.
  - **Active Directory Domain Services (AD DS) and Microsoft Entra ID (formerly Azure Active Directory):** AD DS acts as the on-premises cornerstone for user management, authentication, and authorization specifically for the virtual machines hosted on Azure Stack HCI. It ensures secure access and control within the local environment. Meanwhile, Microsoft Entra ID extends this identity and access management to the cloud, enabling users to authenticate securely from any device, regardless of location, when accessing their virtual desktops through Azure Virtual Desktop. This hybrid identity model offers a seamless and secure user experience across both on-premises and cloud resources.
  - **User Profile Management: Azure File Sync and FSLogix:** In this on-premises VDI solution, Azure File Sync ensures user profiles are efficiently synchronized across virtual desktops, contributing to a consistent user experience. Additionally, FSLogix enhances profile management, particularly in multi-session environments, by optimizing profile containers for faster login times and improved performance.
- Network Infrastructure: The network infrastructure, including switches, routers, and firewalls, connects all components and enables communication between them.

## 2.2 Known limitations

The access to your on-premises or Active Directory domain-joined resources may be impacted by the following known limitations. It is advisable to take these limitations into account when determining the suitability of Microsoft Entra-joined VMs for your environment.

- Azure Virtual Desktop (classic) doesn't support Microsoft Entra joined VMs.
- Microsoft Entra joined VMs don't currently support external identities, such as Microsoft Entra Business-to-Business (B2B) and Microsoft Entra Business-to-Consumer (B2C).

## 2.3 Hardware configurations for Azure Virtual Desktop on Azure Stack HCI

- **Lenovo SR650V3 Server:** Depicts the physical server housing the entire solution.
- **Azure Stack HCI:** Illustrates the hyperconverged infrastructure layer managing the virtualized environment.
- **Hyper-V VMs (Virtual Desktops):** Shows the individual virtual machines hosting the user desktops.
- **AVD Control Plane (Azure):** Represents the Azure-based control plane managing the AVD environment.
- **Remote Desktop Clients:** Shows various user devices connecting to their virtual desktops.
- **AD DS:** Depicts the Active Directory Domain Services for user authentication and authorization.
- **Azure File Sync:** Shows the synchronization of user profiles across virtual desktops.
- **Network Infrastructure:** Illustrates the network connections between all components.

Key Design Considerations:

- **Scalability:** The architecture is designed to scale horizontally by adding more Lenovo SR650V3 servers to the Azure Stack HCI cluster as the number of users and virtual desktops grows.
- **High Availability:** Azure Stack HCI provides built-in resiliency and failover capabilities, ensuring minimal downtime in case of hardware or software failures.
- **Security:** The on-premises nature of the solution, combined with Azure Stack HCI's security features and integration with AD DS, provides robust protection for user data and access.
- **Performance:** Unleashing the Power of Lenovo SR650V3 and Intel Xeon Scalable Processors: The Lenovo SR650V3, equipped with high-performance Intel Xeon Scalable processors, lays the foundation for exceptional virtual desktop performance. These processors, offering a range of core counts and clock speeds, handle the demanding workloads of AVD with ease.
- **Manageability:** Streamlined Control through the Azure Portal Azure Stack HCI, in conjunction with the Azure portal, provides a unified and intuitive interface for managing your entire on-premises VDI environment on the Lenovo SR650V3 server. This single pane of glass approach simplifies deployment, configuration, monitoring, and troubleshooting, significantly reducing administrative overhead and streamlining operations. From provisioning virtual desktops to managing user access and monitoring system health, the Azure portal offers comprehensive control, empowering administrators to efficiently manage their VDI.

## 3 Deployment and Configuration

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The deployment process outlined in this guide offers a comprehensive and flexible approach to deploying Azure Virtual Desktop on Azure Stack HCI 23H2. This section covers some deployment pre-requisite configurations.

### 3.1 Prerequisites and Planning

- An Azure Stack HCI cluster minimum version 23H2 and registered with Azure. From a CPU perspective, it's recommended to have at least 16 cores, with 256GB memory, but this is largely determined by your workload requirements. A minimal install of Azure Virtual Desktop with a single VM cluster will likely consume approximately 24-30GB RAM.
- We recommend 1TB storage capacity in your Azure Stack HCI storage pool used to store virtual machines. However, again, this will be determined by your workload requirements.
- Active Directory domain, you need a domain account that can join computers to your domain. For Microsoft Entra Domain Services, you would need to be a member of the AAD DC Admin group.
- User Account Requirements. Users must have accounts in the Microsoft Entra ID system. For Azure Virtual Desktop on Azure Stack HCI deployments using AD DS - Configure Microsoft Entra Connect for user identity synchronization between AD DS and Microsoft Entra ID.
- External internet connectivity for both the Azure Stack HCI nodes, and the Azure Virtual Desktop components.
- Azure subscription for Azure Virtual Desktop Session Host Pool with the appropriate permissions.
- Network Validation for AVD Links - <https://docs.microsoft.com/en-us/azure/virtual-desktop/safe-url-list>
- Ensure your account is granted the following built-in RBAC roles at the resource group or subscription level. To assign these roles to a resource group, ensure it has been created beforehand.



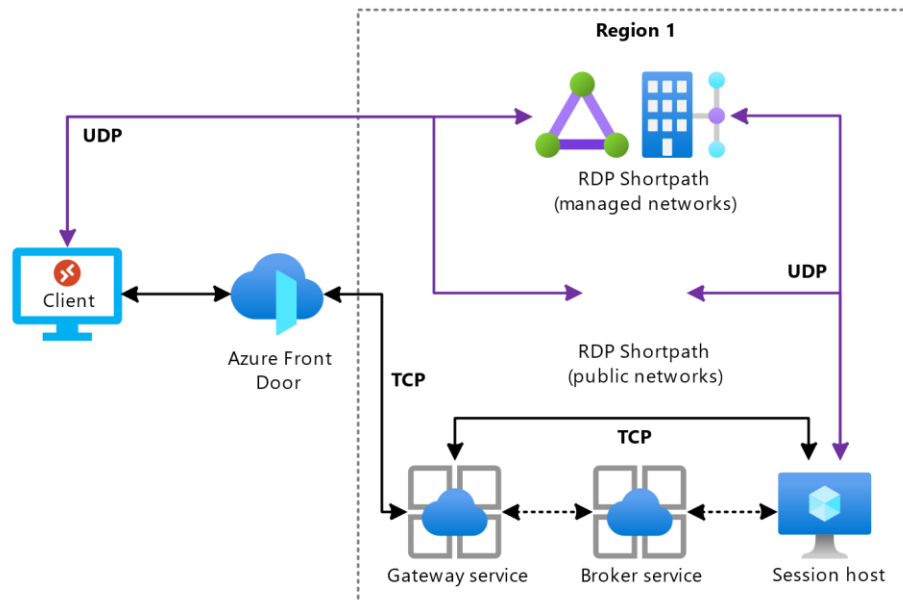


Figure 2 RDP connection process high level

## 3.2 Step-by-Step Deployment

Before starting the AVD deployment, create a Logical Network for use by AVD or simple Virtual Machines.

### Network Preparation

#### 1. Choose Network Layout:

- Select a pre-defined network configuration from the available options that aligns with your physical server's cabling. This configuration will guide the setup of your virtual network within Azure Stack HCI.

### Domain Preparation

#### 2. Active Directory:

- Ensure your existing Active Directory domain is correctly configured and ready for integration with Microsoft EntraID (Formerly known as Azure Active Directory)

## Cluster Deployment

3. **Download Installation Media:**
  - Acquire the Azure Stack HCI version 23H2 ISO file from the Azure portal.
4. **Install OS on Servers:**
  - Install the downloaded Azure Stack HCI operating system on each server designated to be part of the cluster.
5. **Configure Proxy (Optional):**
  - If your network environment utilizes a proxy server for internet access, configure the necessary proxy settings on all servers within the cluster.
6. **Register Servers & Assign Permissions:**
  - Execute the Azure Arc registration script on each server intended for inclusion in the cluster.
  - Assign the appropriate permissions required for successful deployment.
7. **Create Azure Stack HCI Cluster:**
  - **Azure Portal:** Leverage the Azure portal's intuitive interface to select the Arc-registered servers and create the Azure Stack HCI cluster.
  - **ARM Template (Advanced):** For automated cluster creation, utilize an Azure Resource Manager (ARM) template (refer to official documentation for detailed instructions).

## AVD deployment on Azure Stack HCI

### Azure Virtual Desktop Deployment (Separate Process):

Please note that these steps outline the process of deploying Azure Virtual Desktop on your newly established Azure Stack HCI cluster and are not directly part of the Azure Stack HCI deployment itself.

1. **Choose a VM Image:**
  - **Azure Marketplace:** Explore the Azure Marketplace to select a pre-configured virtual machine image that suits your requirements. These images often come with pre-installed applications and configurations, accelerating your setup.
  - **Custom Image:** If you have specific needs, you can utilize a custom image prepared in advance. This image should encompass the desired operating system and any necessary applications.
2. **Create a Virtual Network:**
  - Design a virtual network within Azure Stack HCI that mirrors your existing network layout, ensuring seamless integration.
3. **Create a Host Pool:**
  - Initiate the setup of your virtual desktops by creating a host pool.
  - (Optional) Create Virtual machines by selecting the image and the defining the configuration of the virtual machines to be deployed on the HCI Cluster
4. **Define Your Workspace:**
  - Establish the workspace environment for your virtual desktops, tailoring it to your users needs.

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5. **Designate Application Groups:**

- Organize your applications into groups for streamlined management within your virtual desktop environment.

## 4 Operations and Best Practices

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### 4.1 Monitoring and Management

**Azure Portal: Your Central Command Center:** The Azure portal serves as the primary interface for managing your entire AVD on Azure Stack HCI solution. From a single location, you can monitor the health and performance of your virtual desktops, Azure Stack HCI infrastructure, and related Azure services.

**Azure Monitor: Insights for Proactive Management:** Azure Monitor collects and analyzes logs, metrics, and alerts from your AVD environment and Azure Stack HCI infrastructure, providing valuable insights into system performance, resource utilization, and potential issues.

- **Performance Monitoring:** Track key performance indicators (KPIs) like CPU utilization, memory usage, storage IOPS (input/output operations per second), and network latency to ensure optimal virtual desktop performance.
- **Health Monitoring:** Set up alerts and notifications to proactively identify and address potential issues, such as resource bottlenecks, service outages, or security threats, before they impact users.

### 4.2 Security and Compliance

- **Security Best Practices:** Implement a layered security approach to protect your VDI environment. This includes:
  - **Network Segmentation:** Isolate the VDI network from other networks to limit exposure and potential attack surfaces.
  - **Firewalls:** Deploy firewalls to control inbound and outbound traffic, blocking unauthorized access attempts.
  - **Antivirus/Anti-Malware:** Install and regularly update antivirus and anti-malware software on all virtual desktops and Azure Stack HCI nodes.
  - **Data Encryption:** Encrypt sensitive data at rest and in transit to protect it from unauthorized access.
- **Identity and Access Management:**
  - **Role-Based Access Control (RBAC):** Assign granular permissions to users and administrators based on their roles and responsibilities.
  - **Multi-Factor Authentication (MFA):** Enforce MFA to add an extra layer of security to user authentication.
  - **Conditional Access:** Utilize Conditional Access policies to control access to virtual desktops based on factors like user location, device compliance, and risk level.

- **Compliance Considerations:** Understand and adhere to any industry-specific or regulatory compliance requirements that apply to your organization. Ensure that your AVD on Azure Stack HCI solution meets these standards.

## 4.3 Backup and Disaster Recovery

- **Backup Strategies:** Implement a comprehensive backup strategy to protect your virtual desktops, user data, and Azure Stack HCI infrastructure. Consider:
  - **Azure Backup:** Leverage Azure Backup to back up your on-premises virtual machines and data to the cloud for added protection and off-site storage.
  - **Third-Party Backup Solutions:** Explore third-party backup solutions that integrate with Azure Stack HCI to provide additional backup and recovery options.
  - **Native Backup Capabilities:** Utilize the built-in backup features of Azure Stack HCI and Windows Server to create local backups.
- **Disaster Recovery Planning:** Develop a well-defined disaster recovery plan that outlines the steps to take in the event of a disaster, such as a hardware failure, data corruption, or natural disaster. Consider:
  - **Recovery Time Objective (RTO):** Define the maximum acceptable downtime for your VDI environment.
  - **Recovery Point Objective (RPO):** Determine the maximum acceptable data loss in the event of a disaster.
  - **Failover and Failback Procedures:** Establish procedures for failing over to a secondary site or cloud environment and failing back to the primary site once it's restored.
- **Testing and Validation:** Regularly test and validate your backup and disaster recovery plans to ensure they work as expected and meet your RTO and RPO objectives.

## 4.4 Performance Optimization

- **Image Management:**
  - Create and maintain optimized virtual desktop images to improve performance and reduce storage consumption.
  - Consider using tools like the Azure Image Builder to automate the image creation process.
- **Resource Allocation:**
  - Allocate CPU, memory, and storage resources to virtual desktops based on user needs and workload requirements.
  - Monitor resource utilization and adjust allocations as needed to ensure optimal performance.
- **Network Optimization:**

- Configure Quality of Service (QoS) policies to prioritize network traffic for virtual desktops, ensuring a smooth and responsive user experience.
- Monitor network bandwidth and latency to identify and address potential bottlenecks.

## 4.5 User Experience

- **User Onboarding:** Provide clear and concise instructions to users on how to access their virtual desktops and applications. Offer training and support resources to help users get started and troubleshoot common issues.
- **Feedback and Support:** Establish channels for collecting user feedback and providing timely support. This will help you identify and address any issues impacting the user experience and continuously improve the VDI environment.

## 5 Conclusion

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This reference architecture has provided a comprehensive overview of deploying and managing Azure Virtual Desktop (AVD) on Azure Stack HCI, powered by the Lenovo ThinkSystem SR650 V3 server. By combining the flexibility of AVD with the on-premises control of Azure Stack HCI, organizations can architect a secure, scalable, and cost-effective virtual desktop infrastructure (VDI) solution.

### Key Takeaways

- **On-Premises VDI with Cloud Benefits:** AVD on Azure Stack HCI with Lenovo SR650V3 delivers the advantages of cloud-based VDI while keeping sensitive data and workloads within your own datacenter.
- **Powerful Hardware Foundation:** The Lenovo SR650V3 server, with its high-performance Intel Xeon Scalable processors and robust architecture, provides a solid foundation for delivering a seamless user experience.
- **Streamlined Management:** Azure Stack HCI, combined with the Azure portal, offers a unified and intuitive interface for managing the entire VDI environment, reducing administrative overhead and complexity.
- **Enhanced Security and Compliance:** This on-premises solution provides greater control over data security and compliance, critical for organizations operating in regulated industries.
- **Hybrid Cloud Integration:** Seamlessly integrate your on-premises AVD environment with Azure for additional capabilities like backup, disaster recovery, and cloud bursting.

### Next Steps

- **Evaluate Your Requirements:** Carefully assess your organization's specific needs and requirements to determine if this reference architecture is the right fit for your VDI strategy.
- **Consult with Experts:** Engage with Lenovo and Microsoft experts to discuss your specific use cases and receive tailored guidance on design, deployment, and management.
- **Plan for the Future:** As your organization grows and technology evolves, ensure your VDI solution can scale and adapt to meet changing demands. Leverage the flexibility of AVD on Azure Stack HCI with Lenovo SR650V3 to future-proof your VDI investment.

**We encourage you to explore the possibilities of AVD on Azure Stack HCI with Lenovo SR650V3 and unlock the full potential of on-premises VDI with hybrid cloud benefits.**

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