AZURE STACK HCI: HIGH-PERFORMANCE MICROSOFT SQL SERVER

Leverage your Azure Stack HCI investment to run Microsoft SQL Server for highly available and highly performant enterprise database applications. Azure Stack HCI with Microsoft SQL Server also provides the ability to use Azure Site Recovery to migrate, restore, and protect customers' data. Below, you will find a how-to guide for deploying Microsoft SQL Server on Lenovo ThinkAgile MX for Azure Stack HCI that includes:

- Solution Overview
- Step by step documentation to deploy Microsoft SQL Server on Azure Stack HCI

Overview of High-performance Microsoft SQL Server

Azure Stack HCI provides enterprise customers a highly available, cost efficient, flexible platform to run a high-performance Microsoft SQL Server leveraging the power of state-of-the-art hardware and Storage Spaces Direct. Azure Stack HCI presents a highly competitive solution for delivering exceptionally performant Microsoft SQL Server. Whether running Online Transaction Processing (OLTP) workloads, or Data Warehouse and BI, to AI and advanced analytics over Big Data, you will benefit from the resiliency that Azure Stack HCI offers. This is especially important for mission critical databases. Leveraging the flexibility to run SQL Server in VMs (Windows Server or Linux), it allows you to consolidate multiple database workloads and easily scale out by adding additional VMs to the Azure Stack HCI environment as needed.
Additionally, Azure Stack HCI enables you to integrate Microsoft SQL Server with Azure Site Recovery service to provide a cloud-based migration, restoration, and protection solution for your organization's data that is reliable and secure.

How to deploy Microsoft SQL Server on Lenovo ThinkAgile MX validated nodes for Azure Stack HCI

1. Hardware and OS configuration for Azure Stack HCI

Lenovo has multiple solutions that are ideal for consolidation of legacy SQL Server deployments on ThinkSystem servers. Lenovo offers these solutions under the ThinkAgile offerings as ThinkAgile MX for Azure Stack HCI.

ThinkAgile MX

Lenovo offers several high-performance options for running mission critical database applications with SQL Server 2019.

Lenovo rack systems feature innovative hardware, software and services that solve customer challenges today and deliver an evolutionary fit-for-purpose, modular design approach to address tomorrow's challenges. These servers capitalize on best-in-class, industry-standard technologies coupled with differentiated Lenovo innovations to provide the greatest possible flexibility in x86 servers. Key advantages of deploying Lenovo rack servers include:

- Highly scalable, modular designs to grow with your business
- Industry-leading resilience to save hours of costly unscheduled downtime
- Expansive storage capacity and flexible storage configurations for optimized workloads

Fast flash technologies for lower latencies, quicker response times and smarter data management in real-time for cloud deployments, database, or virtualization workloads, trust Lenovo racks for world-class performance, power-efficient designs and extensive standard features at an affordable price.

The following Lenovo servers have been certified for Microsoft Azure Stack HCI and are equipped to support up to 2x 8-64-core processors, up to 4TB of memory and over 100TB of storage making them ideal candidates for Azure Stack HCI SQL Server solutions:

- Lenovo ThinkAgile MX3530 Integrated systems and ThinkAgile MX3531 validated nodes (based on SR650 V2)
- Lenovo ThinkAgile MX3330 Integrated systems and ThinkAgile MX3331 validated nodes (based on SR630 V2)
- Lenovo ThinkAgile MX3520 Integrated systems and ThinkAgile MX validated nodes (based on ThinkSystem SR650)
- Lenovo ThinkSystem SR630 validated nodes
- Lenovo ThinkSystem SR665 validated nodes
- Lenovo ThinkSystem SR655 validated nodes
- Lenovo ThinkSystem SR645 validated nodes
- Lenovo ThinkSystem SR635 validated nodes

Plan Hardware Deployment

For planning hardware deployment, please check out this Lenovo Certified Configurations for Microsoft Storage Spaces Direct document.

Step by Step guide to deploy Azure Stack HCI.
For Azure Stack HCI deployment planning on Lenovo ThinkAgile MX, please check out this very popular Microsoft Storage Spaces Direct Deployment Guide.

Install Windows Admin Center (WAC) for managing Azure Stack HCI.

Microsoft Windows Admin Center (WAC) is a browser-based application that is deployed locally and used to manage Windows Servers, Windows Server Clusters and Azure Stack HCI clusters. Microsoft has made WAC extensible so that hardware partners can build additional features specific to their hardware and firmware. Lenovo XClarity Integrator is an example of one such extension implementation. Lenovo XClarity Integrator is designed to help users to manage and monitor the Lenovo ThinkSystem servers through Lenovo XClarity Administrator in Windows Admin Center. Lenovo XClarity Integrator and Windows Admin Center run in the same environment. Lenovo XClarity Integrator that is integrated with Lenovo XClarity Administrator can be used as an out-of-box management tool and a high-efficiency tool for managing and monitoring the Lenovo servers and components, for example, monitoring the overall status of servers, viewing the inventory of components, checking the firmware consistency of cluster nodes, and launching the management interface.

This link provides information on features in the Lenovo XClarity Integrator extension and instructions for installing the extension for Windows Admin Center.

2. Set up Microsoft SQL Server on Azure Stack HCI

The following link demonstrates installing SQL Server in a Windows Server Virtual Machine.
Install SQL Server on Windows

The following link demonstrates installing SQL Server in a Linux Virtual Machine.
Install SQL Server on Linux

Best practices for running SQL Server on ThinkAgile MX for Azure Stack HCI
For a high-performance SQL Server virtualized solution, implement the following best practices:

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- Configure UEFI (Bios) settings to set Operating mode to Maximum performance.
- Configure power profile in Windows Server to 'High performance'.
- SQL server database and log drives are recommended to be formatted with 64KB NTFS cluster size.
- The OS and SQL server binary drives are recommended to be formatted with standard 4KB NTFS cluster size.
- TempDB is shared by many processes and users as a temporary working area and should be configured appropriately. Default configuration will be suitable for most workloads. Use the install experience for guided configuration. More info in Microsoft TempDB Database documentation
- If the server is dedicated to SQL Server workload, use the default dynamic memory management model or follow Microsoft SQL documentation guidelines for manually configuring memory options if finer grain control is desired.

Lenovo ThinkSystem SR665 Validated Node

3. Monitoring and performance tuning
   To ensure performance and health of your Microsoft SQL Server instances on Azure Stack HCI, it is important that appropriate monitoring and tuning is put in place. Additional SQL Server database engine tutorials are included here. For tuning SQL Server 2016/2017 for high performance, the following recommended practices are provided.

4. High Availability (HA)
   Azure Stack HCI leverages Windows Server Failover Clustering (WSFC) and can be utilized to support Microsoft SQL Server running in VMs (designed to help with hardware failure). Microsoft SQL Server also offers Always On availability groups (AG) which provides database-level high availability and is designed to help with application and software faults. In addition to WSFC and AG, Azure Stack HCI can also leverage Always On Failover Cluster Instance (FCI) based on using Storage Spaces Direct technology for shared storage. All of these options can leverage the Microsoft Azure Cloud witness for quorum control. It is recommended that cluster AntiAffinity rules in WSFC be leveraged for the VMs to be placed on different physical nodes in order to maintain uptime for SQL Server in the event of host failures when you configure Always On availability groups.

5. Set up Azure hybrid services

   Azure Site Recovery offers business continuity and disaster recovery (BCDR) strategy. Set up disaster recovery for SQL Server allows organizations to protect the SQL Server back end of an application to help keep your data safe, and your apps and workloads online, when planned and unplanned outages occur.

   Azure Backup supports backing up and restoring Microsoft SQL Server with application consistency. Install Azure Backup Server to start backup of your on-prem SQL data.

Alternatively, you can also leverage Azure Blob Storage service for SQL Server to backup and restore to Azure Blob Storage service. This is suitable for off-site archiving. To manage the Azure Blob Storage backups, you can leverage the Managed SQL Backup feature included in Microsoft SQL Server.

In addition to the backup scenario, you can setup other database services that Microsoft SQL Server offers, connecting to Azure services such as (but not limited to) Azure Data Factory, and Azure Feature Pack for Integration Services (SSIS).

Summary

With completion of a Microsoft SQL Server deployment using Azure Stack HCI on Lenovo servers, you now have a platform capable of running complex, highly available database workloads in VMs.