

SMALL FOOTPRINT

EXCEPTIONAL PERFORMANCE



Dell Integrated System for Microsoft Azure
Stack HCI with KIOXIA PM6 Series SAS SSDs

EXECUTIVE SUMMARY

The Internet of Things is an emerging concept and is growing fast and it typically consists of various levels of integration, and edge computing is one of them. Edge Computing needs to be lean, Flexible, modular, and open infrastructure and is the primary requirement of IoT solutions. The primary goal of edge computing is to run your workloads and get quick actionable insights right at the edge where data is created using purpose-built hardware-as-a-service and is accomplished with Azure Stack Edge. Azure Stack Edge is an Azure-managed device that brings compute, storage, and intelligence to the edge to get actionable insights.

Through high-performance hardware and software technologies, businesses improve time to action and avoid data transfer bottlenecks. Customers can leverage pre-configured servers to eliminate the need for rack, power, cooling, security, or other infrastructure upkeep factors, letting in-house teams focus on application optimization instead. Additionally, it provides the latest security, performance, and feature updates through an Azure subscription. The new Azure Stack HCI Technical use cases span IoT, Branch Office and Edge, Virtual Desktop Infrastructure

(VDI), High Performance SQL Server, and Scale-out Storage.

Small office and remote branch office (ROBO) use cases present special challenges for IT organizations who want to implement a scalable, resilient, secure, and highly performing platform at an affordable TCO. The infrastructure must be capable of efficiently running a highly diversified portfolio of applications and services but be simple enough to be deployed, updated, and supported by a local IT generalist.

The image shows a dark blue rounded rectangle containing four circular icons, each with a label. From left to right: 1. An icon of a house with circuit lines, labeled "Remote Office Branch Office". 2. An icon of a laptop inside a cloud with circuit lines, labeled "Virtual Desktop Infrastructure". 3. An icon of a database cylinder, labeled "Enterprise Databases". 4. An icon of a database cylinder with an upward-pointing arrow, labeled "Scale-Out Storage".

SPECIFICATIONS

Dell Integrated System for Microsoft Azure Stack HCI

Dell Technologies offers an integrated system for Azure Stack HCI which is essentially all-in-one validated HCI system that leverages an integrates foundation combined with Kioxia PM6 Series SAS SSDs to deliver Performance, operational efficiency, cloud like flexibility reducing deployment time and complexity. This platform addresses proximity, responsiveness and mobility challenges edge computing experiences. Dell Technologies and Microsoft help you accelerate business outcomes in these unique ROBO environments with our Dell EMC Solutions for Microsoft Azure Stack HCI.

KIOXIA Enterprise SAS SSDs – PM6 Series

Dell integrated system for Microsoft Azure Stack HCI incorporates the KIOXIA PM6 Series of dual-port 24G SAS SSDs. These enterprise solid state devices (SSDs) are suitable for high-performance Tier 0 computing, server and storage systems that require high levels of performance and reliability. These drives are optimized for read intensive applications, including web services, transactional databases, data warehousing, streaming media and video on demand. The series provides high levels of performance, reliability and endurance, and is designed to minimize total cost of ownership.

For more information and specifications regarding KIOXIA PM6 series SAS SSDs please refer to the link below:



[KIOXIA Enterprise PM6 Series](#)

Azure Stack HCI Test Lab Cluster Architecture

To demonstrate the performance and scalability of Azure Stack HCI cluster we started with 2 node cluster (single socket 16 core 64G of RAM). Each Server/node is provided with 4 x 3.84TB of Kioxia PM6 Series SAS SSDs.

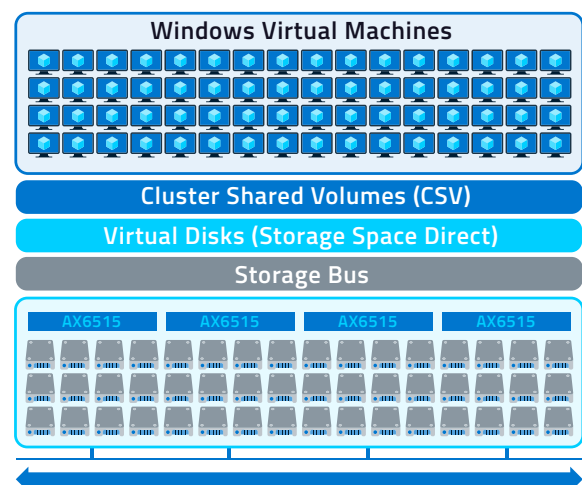
AzS HCI combines this prevalidated hardware from Microsoft partners with the following Windows Server 2019 Datacenter components and management tools:

[Windows Server 2019 Datacenter roles and features](#)

[Hyper-V to run virtual machines \(VMs\) on all physical hosts](#)

[Software Defined Networking \(SDN\) \(optional\) for network virtualization](#)

[Storage Spaces Direct for software-defined storage](#)



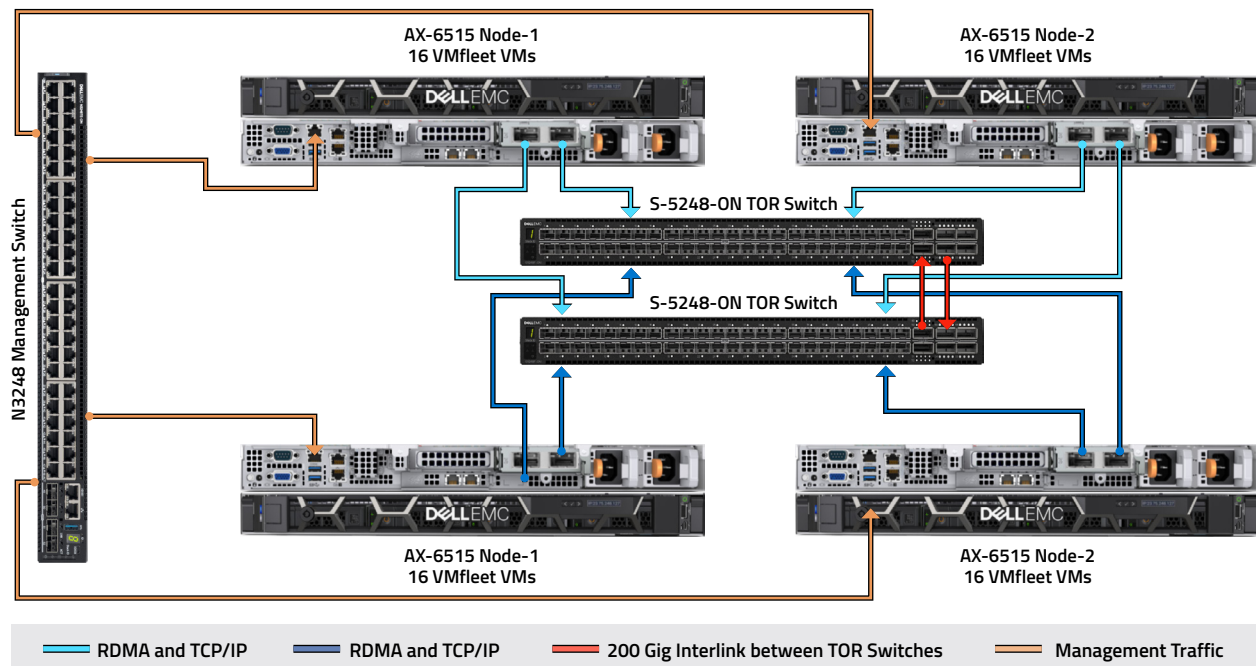
PERFORMANCE BENCHMARKING

Azure Stack HCI Performance

Performance and Scalability are the KPIs for the purpose of benchmarking Azure stack HCI and VMFleet was used to conduct tests. VMfleet is an interface wrapped around Diskspd and used as a storage load generator to stress Azure Stack S2D (Storage Space Direct). VMfleet stresses underlying hardware which includes CPU/Disks/Network to evaluate the stability of Azure Stack S2D.

Test Lab Environment Hardware and Software

The following diagram illustrates the environment created in the Dell Technologies labs for the VMFleet testing. Ancillary services required for cluster operations such as DNS, Active Directory, and a file server for cluster quorum are not depicted.



Test Process and Workload Profiles

VMFleet offers four profiles to benchmark underlying hardware for various types of workloads and use cases.

- **General:** single-threaded, high queue depth, and an unbuffered/writethrough workload against a single target template.
- **Peak:** The goal of this workload is to max out the IOPS values without regard to latency, CPU, or other limitations. This is the hero number.

- **SQL:** This workload seeks to simulate data processing that is focused on transaction-oriented tasks where a database receives both requests for data and changes to the data from multiple users (OLTP).
- **VDI:** This workload seeks to simulate a traditional virtual desktop infrastructure where you may be hosting desktop environments. This workload is defined by running IO against 2 targets, which happen in sequential order.

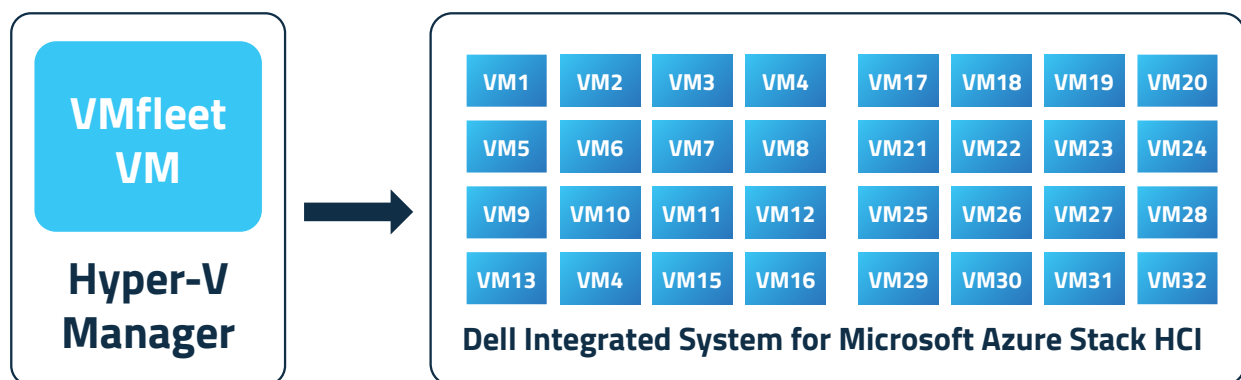
As we are evaluating the performance Azure Stack HCI with Kioxia PM6 Series SAS SSDs for extreme workload conditions, we stressed the hardware using PEAK workload profile to evaluate its performance. Essentially in this peak workload profile, VMfleet uses a thread count of 4, 4K block size, 32 Queue Depth, 0 writes and 100% random.

While the tests are in progress we measured peak IOPS, Avg CPU used and latency from these tests with peak profile.

Performance of Azure Stack HCI - KIOXIA PM6 SAS SSDs vs. Competitor SATA SSDs

VMFleet tests with peak workload profile are conducted on Azure Stack HCI with SATA SSDs and SAS SSDs. During the tests 32 windows virtual machines with core Windows Server 2019 Image created by assigning 1 vCPU, 2GB RAM and 30GB of storage to each VM created. Once all the 32 VMs are created, VMfleet stresses all VMs with Peak Workload Profile. These tests were conducted Azure Stack HCI with SATA SSDs and Kioxia SAS SSDs.

Test Architecture



RESULTS

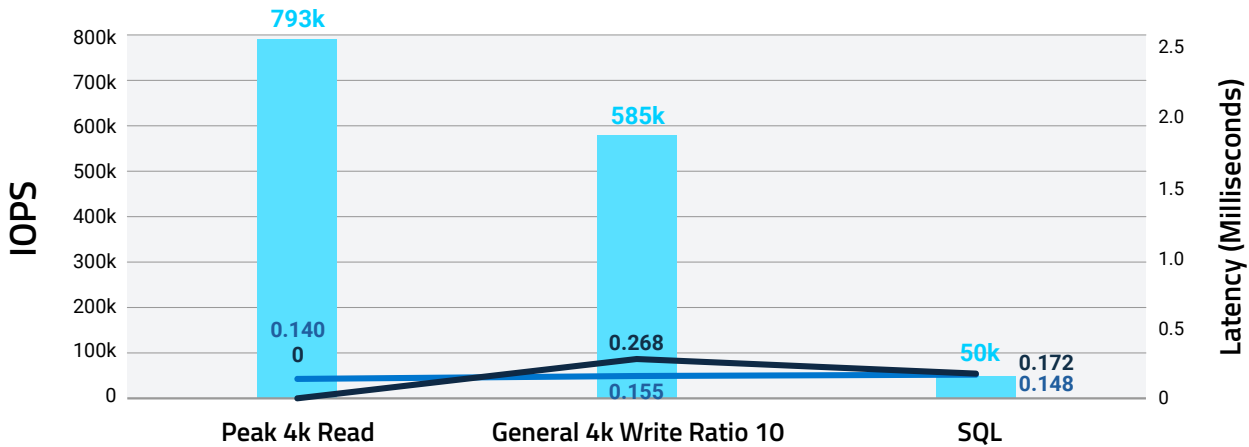
Azure Stack HCI Performance

We conducted tests to evaluate the performance of 2-node Azure Stack HCI with PM6 Series SAS SSDs from the below three workload profiles. These workload profiles are typically observed in analytics, Decision Support Systems, Web applications, VDI, OLTP and OLAP type of workloads. Basic test characteristics of each workload are tabulated below.

Parameter	Workload Profile			
	Peak	General	SQL	
			Data	Log
Block Size (KiB)	4	4	8	32
Queue Depth	32	32	8	1
Threads	4	1	4	2
IO Write %	0	10	30	100
IO Type	Random	Random	Random	Sequential
Misc	5 GB Target File Size and 100% VM Alignment			

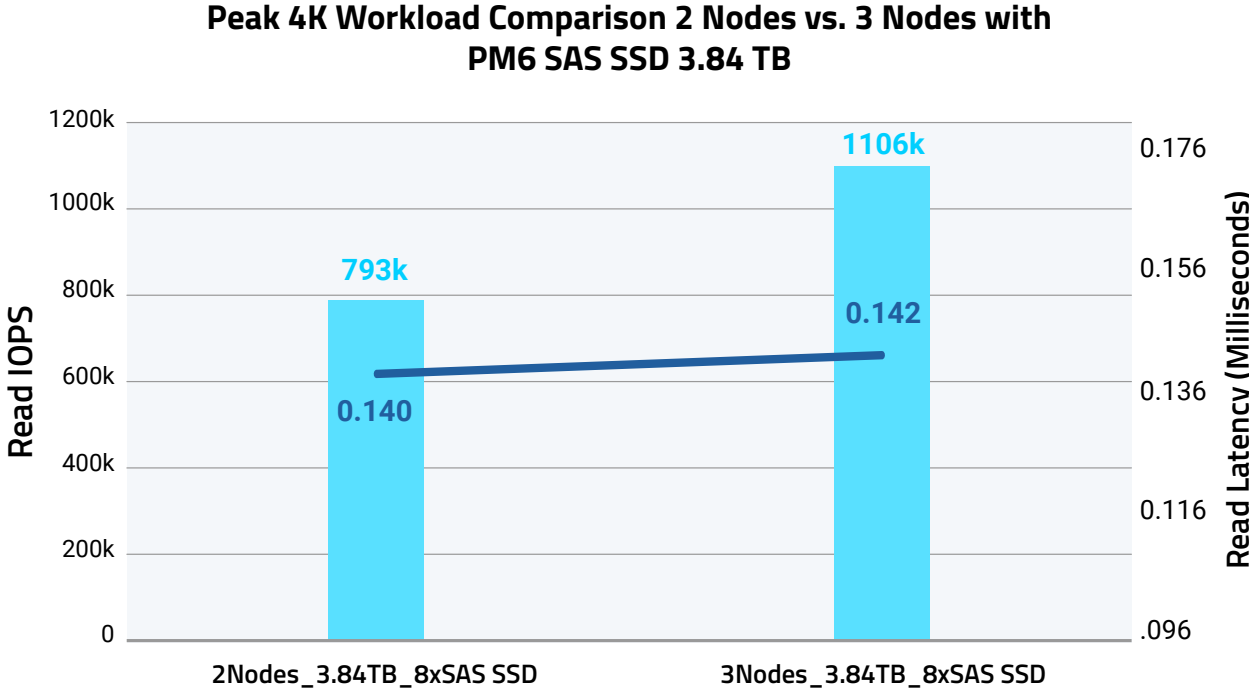
The performance we observed from the 2-node Azure Stack is nothing less than superior. As you can see, the result of the peak 4K workload for the 2-node Azure Stack HCI is at 793K IOPS with read latency of 0.14 milliseconds is exceptional, and these numbers elevate the web applications user experience. For 4K 90% reads and 10% writes, IOPS were at 584K with read latency of 0.15 milliseconds and write latency of 0.268 milliseconds. For general SQL workload we have 50K IOPS with read latency of 0.148 milliseconds and 0.172 milliseconds of write latency. Establishments that rely on remote offices and branch offices benefit hugely from the performance derived from this small footprint.

Azure Stack HCI 2-Node Performance for Different Workload Profiles With 8X PM6 3.84 SAS SSDs



Scaling of Azure Stack HCI

In the new configuration Azure Stack HCI with configured with KIOXIA PM6 Series SAS with 3.84TB capacity. We observed linear scaling with the 3-node cluster achieving 1,105,938 IOPS which is 40% more than with the 2-node cluster.



The results of the scaling test conducted with peak workload profile achieved 1.1 Million IOPS with latency of 0.142 Milliseconds consuming 72% of the available CPU from Azure stack HCI with PM6 SAS SSDs.

SUMMARY

Dell Integrated System for Microsoft Azure Stack hyperconverged infrastructure (HCI) is an all-in-one validated HCI system that leverages an integrated foundation from Dell Technologies. Tests demonstrated superior performance, and these results extensively benefit application and server consolidation needing balance of performance and capacity in ROBO environments. Secondly, it unlocks the value of data while ingesting, transforming and synthesizing at blazing speeds.

Dell Integrated system for Microsoft Azure Stack HCI is a perfect fit for edge computing extensively visible in Manufacturing, Retail, Healthcare, Transportation, Telecom and Utilities industry verticals.

For more information please see: [Dell Integrated System for Microsoft Azure Stack HCI](#).
