

# DxEnterprise & Azure Shared Disks for Highly Available SQL Server Instances

## Introduction

Many organizations are changing the way they run their business and the need to move to the cloud has become increasingly prevalent. Cloud computing provides organizations with the ability to connect to their business environment anywhere, at any time. Beyond that, cloud computing offers key benefits like scalability, business continuity, work flexibility, and plenty of others. Scalability allows organizations to scale up or scale down as their compute and storage needs change. Having data and applications stored in the cloud is key to maintaining business operations as it protects businesses' data and systems in the event of a disaster or another crisis. Cloud computing supplies the most flexible work setting for establishments by enabling employees to access data from wherever they are located and this in turn improves collaboration abilities.

In fact, the benefits of cloud computing are so prominent that research predicts that by 2022, around [60% of enterprises](#) will utilize an external service provider's cloud-managed service offering, which is double the percentage from 2018. In addition, industry estimates suggest there is a major rise in the number of companies moving to the cloud as [73% of enterprises](#) are moving almost all of their applications to SaaS platforms. Businesses are going beyond using the cloud for hosting infrastructure and are now streamlining their core business applications and processes. Cisco Systems Inc. predicts that [more than 84% of workloads](#) will be processed through cloud data centers by 2021.

[Dominating the database management space](#), Microsoft SQL Server attracts new customers every year who are interested in deploying SQL Server in Azure. It is well-known for its flexibility for offering various editions to choose from, its easy-to-access support from specialists, and its on-premises to cloud migration support. Given all of these tools, a growing number of organizations are planning to move their SQL Server deployments to Azure.

## On-Premises vs. Cloud Deployments

There is an abundance of perks for those that choose to move their deployments to the cloud. However, there are disadvantages accompanying cloud computing that have deterred some from making the switch in the past. Beyond the more obvious downfalls like the dependency on a network connection at all times or the hassle to get support from the hosted provider, one major issue that follows cloud computing is the lack of support for shared storage.

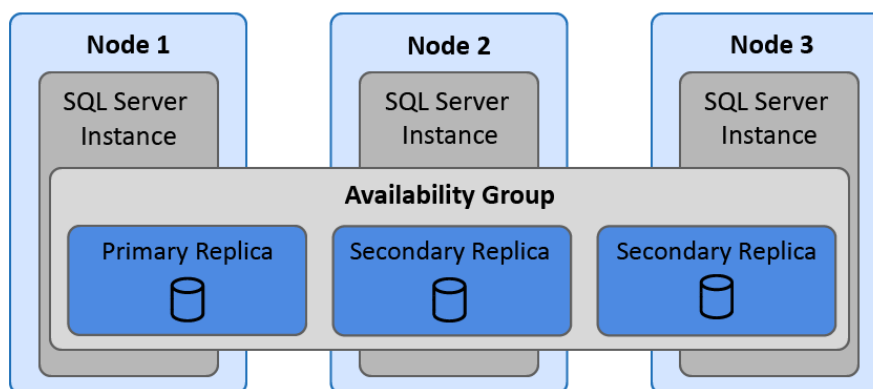
Organizations that have stuck with on-premises deployments only have yet to face this problem as shared storage for on-premises deployments has been in place for a long time. In an on-premises environment, most IT organizations already have architecture in place such as SAN or NAS that serves as a central location to store data that can be shared and retrieved among teams 24/7. Shared storage technology simplifies the process of accessing, migrating, and archiving data that businesses must manage. It plays an essential role for businesses to achieve high availability (HA) and disaster recovery (DR). When one server fails, as long as the shared storage pool is available, the application can be architected to continue running and move to another host, minimizing any interruption to end user applications. Shared storage is key to increase reliability, decrease downtime and achieve higher availability in these type of shared storage clusters.



## Challenges with Cloud Deployments

Despite the many advantages encouraging the shift to the cloud, the inability to have shared storage in the cloud has been a major deterrent to shifting certain workloads, such as database instances, that are traditionally deployed on a shared storage infrastructure. Without a shared storage option, there is no location for the data to reside when building high availability failover clusters.

As a result, those that still want to move their SQL Server deployments to cloud infrastructure have resorted to storage replication as the alternative approach. In most cases, organizations are using availability groups (AGs) to maintain high availability. AGs is a native SQL Server technology that involves replication of databases from one instance to another. Rather than actually store the data in a shared location, there is a copy of the data that is replicated to a secondary database on another instance. One benefit of AGs is it allows teams to access the replicated data as a copy with read-only rights which is useful for tasks like reviewing and reporting.



## Challenges with Availability Groups

The AG method in the cloud can be configured for both HA and DR, but the availability is not at the entire SQL Server instance level and this approach can become very expensive over time. AGs only deliver fault tolerance at the user-database level, rather than for the entire instance. At an instance level, fault tolerance applies to additional details like SQL logins, normal maintenance plans, external database dependencies, jobs, alerts, linked servers, etc. With AGs, manual configuration on every server is required for these entities, increasing complexity. Additionally, the principal and mirror servers must run on the same version of SQL Server causing incompatibility and more downtime for updates to account for. Furthermore, the lack of a shared storage for user databases on AGs means that there are more servers and cores per server that need to be managed and licensed.

Organizations that want to implement SQL Server AGs are either limited to a single database across two replicas for [Standard Edition](#) or are forced to pay much more for the [Enterprise Edition](#) to create AGs with three or more replicas or more than a single database. Therefore, most organizations wanting to run availability groups to any meaningful degree are forced to face the costs of Enterprise Edition. For comparison, the SQL Server 2019 [Standard Edition](#) is listed at \$3,586 per two cores. On the other end, the [Enterprise Edition](#) sits at an epic price of

\$13,748 per two cores, which is nearly 4x the cost of the Standard Edition. Though AGs is an efficient method to enhance SQL Server cloud deployments, countless organizations do not have the budget to maintain Enterprise Edition and license the number of servers they actually need.

## Microsoft Azure Native Shared Storage

The nonexistence of shared storage in Azure has been a major issue surrounding the industry for years; however, the first solution on the market has recently made its appearance. On July 16, 2020, [Microsoft announced the general availability](#) of Azure shared disks. Azure shared disks is the industry's first shared cloud block storage that enables the next wave of block storage workloads migrating to the cloud including clustered databases, parallel file systems, persistent containers, and machine learning applications. Built for Windows or Linux based-clustered filesystems, this new capability enables customers to run latency-sensitive workloads without compromising on well-known deployment patterns for HA and fast failover. It is the only shared block storage available that supports both Windows and Linux-based clustered or high availability applications.

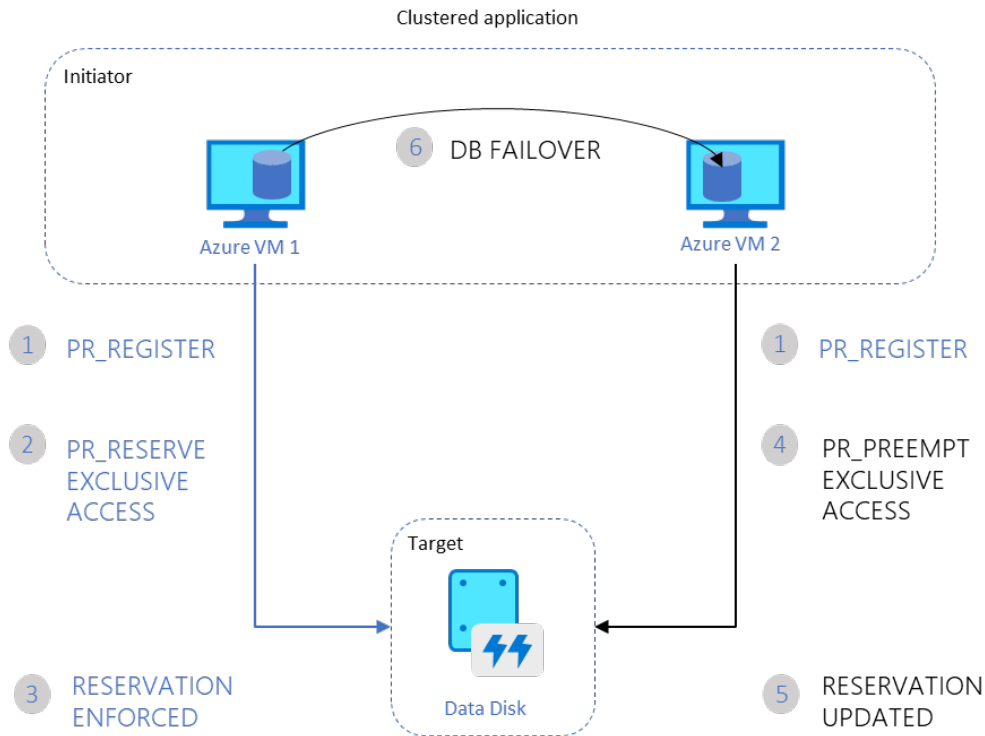


Azure shared disks are available both on [Ultra Disks and Premium SSDs](#). On Premium SSDs, there is an additional fee per mount that depends on the disk size. There is no charge per mount for Ultra disks, rather users are charged for the capacity, total IOPS, and total throughput on the disk. You can find additional information about the other features and capabilities of Azure shared disks in this [product documentation](#).

## Azure Shared Disks for SQL Server HA Instances

With Azure shared disks, customers have the flexibility to migrate their clustered environments running on Windows or Linux to Azure and it is designed to support one the most common use cases: SQL Server HA instances. For organizations deploying SQL Server, a Failover Cluster Instance (FCI) is a major feature to consider. FCIs provide protection at the instance level for those SQL Server instances with automatic failover in the event that hardware, operating systems, applications or services fail. With the release of Azure shared disks, achieving HA for SQL Server deployments in Azure is now possible.

To illustrate, below is an example of a 2-node clustered database application environment orchestrating failover using Azure shared disks provided by this [Microsoft Azure blog](#).



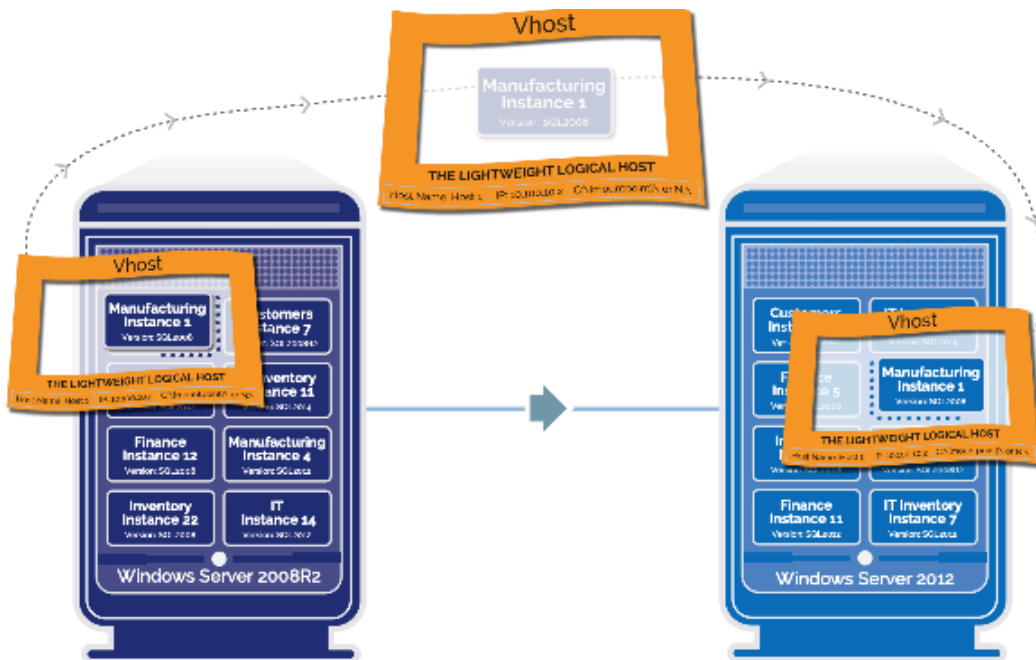
### FAILOVER CLUSTER

The clustered application is running on both Azure VMs and registers the intent to read or write to the disk. One application instance takes the exclusive reservation to write the disk, while the second VM reserves the right to read the disk. Given that Azure VM 1 reserves the ability to write, any write attempted from the application instance on Azure VM 2 will not be successful. If the application instance on Azure VM 1 goes down, the instance on Azure VM 2 is now able to initiate a database failover and take over the disk. This new reservation is enforced on the Azure Disk and it will no longer accept writes from the application on Azure VM 1. The example above illustrates a clustered database application with only two VMs; however, there can be more than 2 VMs running, providing further instances to failover to.

### Introducing DxEnterprise

DH2i takes an innovative approach to Microsoft SQL Server Deployments with DxEnterprise – a multi-platform Smart Availability software built on patented technology. DxEnterprise supports Windows Server, Linux, and Docker and is particularly optimized for native or containerized Microsoft SQL Server deployments on any platform. This technology leverages standalone instances for fewer requirements and greater cluster

flexibility. DxEnterprise decouples application workloads, file shares, services and Docker containers from the underlying infrastructure without the standardization of the entire database environment. This feature enables complete instance mobility from any host to any host, anywhere with just an application or container stop and restart.



InstanceMobility® uses a Vhost, which is a near-weightless wrapper with a network name and an IP address that can easily be unbound from one host and bound to another. The Vhost allows the instance to run on the local OS with a local application install – there is no OS weight or boot time to wait on, rather just the time for the local application to start. The agility provided by the Vhost technology promises the most cost-efficient deployment for both licensing and cloud metering.

With DxEnterprise, organizations get all of the advantages of intelligent, self-healing high availability and disaster resilience with multi-subnet failover. Paired with Azure shared disks, companies can achieve true HA for their SQL Server deployments in Azure while getting easy workload portability and dramatically reducing costs and planned downtime.

## SQL Server HA on Linux

Linux is the world's fastest-growing server operating system and numerous organizations are currently deploying SQL Server on Linux machines. With the release of Azure shared disks,

the need for shared storage in the cloud has finally been met. However, the only way to truly achieve HA instances with SQL Server on Linux is by using DxEnterprise.

Several organizations utilize traditional solutions like Pacemaker to achieve HA for their SQL Server deployments on Linux. Many SQL Server professionals with experience working with Pacemaker for SQL Server have experienced firsthand the various distinct drawbacks that come with it. Pacemaker is very difficult to install and configure and it requires multiple third-party add-ons. It doesn't allow for different OS versions and editions in the same cluster, restricting its flexibility.



DxEnterprise equips customers with a unified HA solution for Linux server operating systems and simplifies the management of Linux SQL Server instances. It is very simple to install and configure and doesn't entail any of the heavy requirements associated with Pacemaker. The instances, servers, and storage are consolidated into manageable utilities for small, medium or enterprise customers – enabling seamless management from a single

admin console. In a standard Linux clustering configuration, the typical OS upgrade option is to build a new cluster and go through the complex process to migrate the application instances to the cluster. DxEnterprise simplifies upgrades as each cluster node can be upgraded in place without rebuilding it. With DxEnterprise InstanceMobility®, any Linux SQL Server instance can be re-hosted transparently on any RHEL, Ubuntu, or CentOS host. DxEnterprise encompasses an intuitive SLA framework with instance-level quality of service (QoS) controls ensuring the best performance and availability. Combined with Azure shared disks, fast failover and true high availability for SQL Server deployments on Linux can be attained.



## SQL Server HA on Windows

Windows is another popular OS of choice for SQL Server deployments in the cloud as it can be deployed on almost every version of Windows Server. Furthermore, there are some capabilities and benefits of Windows SQL Server deployments with DxEnterprise. Named instances are a key bonus to using DxEnterprise for SQL Server Windows. The ability to choose a unique name for each instance allows users to stack their instances on the same node and in the same cluster resulting in more instances on fewer machines. Just this feature alone enables customers to consolidate, save on licensing costs and simplify management with fewer machines to manage.

Many organizations that want to achieve HA for their SQL Server deployments on Windows leverage Windows Server Failover Clustering (WSFC). This feature assists Microsoft's Failover Cluster Instance (FCI) solution for HA and DR. Though it integrates well with Microsoft's solutions, there are some cons to using WSFC. WSFC is complex to get up and running and the learning curve to master it is quite steep. There is a large compatibility list and numerous pre-requisites that must be met. Setup is complex because any servers that users want to be added as cluster nodes must all be running on the same version of Windows Server. Migrations are a painful job as it takes a deal of time to roll clusters to a new operating system. Updates and upgrades also tend to take a longer time, so these tasks are typically accomplished during downtime, eating up spare free time from admins' schedules. Additionally, WSFC customers using SQL Server Standard Edition are limited to 2-node FCI clusters. However, if the goal of a business is to consolidate or create a larger environment, they have to come up with extra funds to pay for Enterprise Edition.

DxEnterprise eliminates the complexities of WSFC and frees customers from the overwhelming licensing costs of Windows Server OS sprawl. With DxEnterprise, organizations can create highly available clusters with more than 2 nodes on any edition. This is crucial because organizations are no longer obligated to purchase Enterprise Edition for their HA cluster environment. Using DxEnterprise to safely stack instances and containers can result in an 8-15x reduction in Windows Server OSes. This not only leads to fewer OSes to license and manage, but licenses can be reclaimed for future use saving customers on average 25%-60% on Microsoft licensing costs. DxEnterprise can cohesively manage any mix of Windows Server 2008 R2 and newer – all servers do not have to be on the same version as with WSFC. Any upgrades can be done in place without rebuilding the cluster, saving admins a ton of time. In less than 30 seconds, workloads can be dynamically moved—either automatically as a result of an HA event, or manually initiated by an administrator—from one server host to another with a consistent application endpoint, no matter where the instance is running. DxEnterprise also leverages native Windows file system (NTFS) and shared storage technology to coordinate access to a pool of disk resources in the cluster, for consistent disk



presentation regardless of where the Vhost is active. By blending Azure's shared disks with the capabilities of DxEnterprise, users can create highly available SQL Server clusters in Azure that naturally offer opportunities for consolidation.



## In Summary

Organizations need to be able to connect to their business environment and retrieve data whenever and wherever they need it. Securing and managing data in an on-premises setting is a model that has been in place for years. As more deployments are being moved to the cloud, the need to ensure uninterrupted access to applications beyond on-premises has become extremely important for business operations. Fortunately, with the release of Azure shared disks, this gap in the market has been met. Customers that are deploying SQL Server in Azure are now able to create HA instances using the shared storage disk for data failover.

Organizations currently using Pacemaker or WSFC for SQL Server cluster management face various challenges with their deployments. With these legacy solutions, configuration and ongoing maintenance are complicated, numerous pre-requisites must be met, and the associated licensing costs can be extreme. DxEnterprise's innovative approach rids these common disruptions while offering all of the benefits of intelligent, self-healing HA and DR. DxEnterprise provides flexibility by allowing users to build clusters with more than 2 nodes on any edition and pool together the different versions of SQL Server for further consolidation. Coupled with Azure shared disks, customers can dramatically reduce the complexity of HA for their SQL Server deployments in Azure - all while significantly reducing costs and planned downtime. Organizations looking to make the switch to Azure can have highly available SQL Server with shared storage up and running in minutes.

If you would like to give it a try for your organization, check out these technical quick-start guides for [Linux](#) and [Windows](#) that detail how to quickly deploy DxEnterprise in Azure with Azure shared disks.

Ready to spin it up now? Access our [DxEnterprise offer](#) on the Azure Marketplace to get started.

**Request a demo of DxEnterprise:**  
[dh2i.com/demo](https://dh2i.com/demo)