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Nasuni Reference Architecture: VMware Horizon on Azure VMware Solution

VMware Horizon for Azure VMware Solution (AVS) is an integrated hybrid cloud solution for virtual desktops and applications. It combines the enterprise capabilities of the VMware Software-Defined Data Center (SDDC), delivered as Infrastructure as a Service (IaaS) on AVS, with the market-leading capabilities of VMware Horizon.

Virtual desktops require scalable, cost-effective, and high-performance file shares to store and collaborate on user and application data. They also require advanced data protection, with fast recovery from ransomware. This reference architecture provides a framework and guidance for architecting a scalable, cost-effective, cloud-based file data services solution for VMware Horizon on AVS using the Nasuni File Data Platform.

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Introduction

VMware Horizon for Azure VMware Solution (AVS) delivers a seamlessly integrated hybrid cloud for virtual desktops and applications. It combines the enterprise capabilities of the VMware Software-Defined Data Center (SDDC), delivered as Infrastructure as a Service (IaaS) on AVS, with the market-leading capabilities of VMware Horizon, for a simple, secure, and scalable solution.
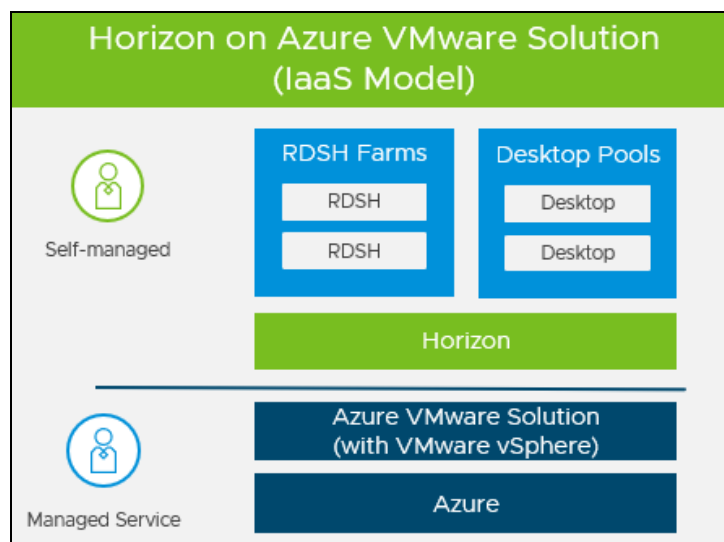

Figure 1: Horizon on Azure VMware Solution Overview.

For more details on the VMware Horizon on Azure VMware Solution, please refer to Horizon 8 on Azure VMware Solution Architecture.

VDI File Storage Challenges

Traditionally, VDI file storage has been based on Network Attached Storage (NAS) and file server hardware located on-premises, along with accompanying solutions to provide file backup, recovery, and disaster recovery. This traditional approach is expensive, complex to administer, and difficult to scale. It also introduces latency if used with a modern cloud virtual desktop and application solution like VMware Horizon due to the physical distance and slower WAN connections between cloud desktops and on-premises file storage.

Moving file servers into the cloud to address the distance and latency issues is no better, because file server storage in the cloud is more expensive than on-premises, backup and DR solutions are still required, and there is no easy way to share the same files across cloud regions when virtual desktops are deployed in different cloud data centers.

Nasuni: Ideally Suited for VDI File Storage

As a file data services platform built specifically for cloud and hybrid cloud environments, Nasuni is ideally suited to provide file shares for virtual desktops.

Nasuni consolidates all file data in durable, scalable, and economical cloud object storage, such as Azure Blob. The Nasuni UniFS® global file system resides natively in object storage and organizes the file data, snapshots, and metadata in immutable, encrypted format. Nasuni Edge virtual machines deployed in the cloud or on-premises

cache copies of frequently accessed files from object storage and enable users and applications to access data through standard SMB (CIFS) and NFS file sharing protocols.

Every Nasuni Edge is kept in sync by Nasuni's cloud orchestration service, enabling the same file shares to be presented in multiple edge locations, including VDI pods located in different data centers. With this software-defined architecture, Nasuni can offer unlimited file storage capacity on-demand, high-performance file access at any edge location, built-in data protection that guards against ransomware, and a true global namespace for multi-site file sharing.

Nasuni for VMware Horizon on AVS

Nasuni is partnering with VMware and Microsoft to offer a validated file data platform for VMware Horizon on Azure VMware Solution (AVS).
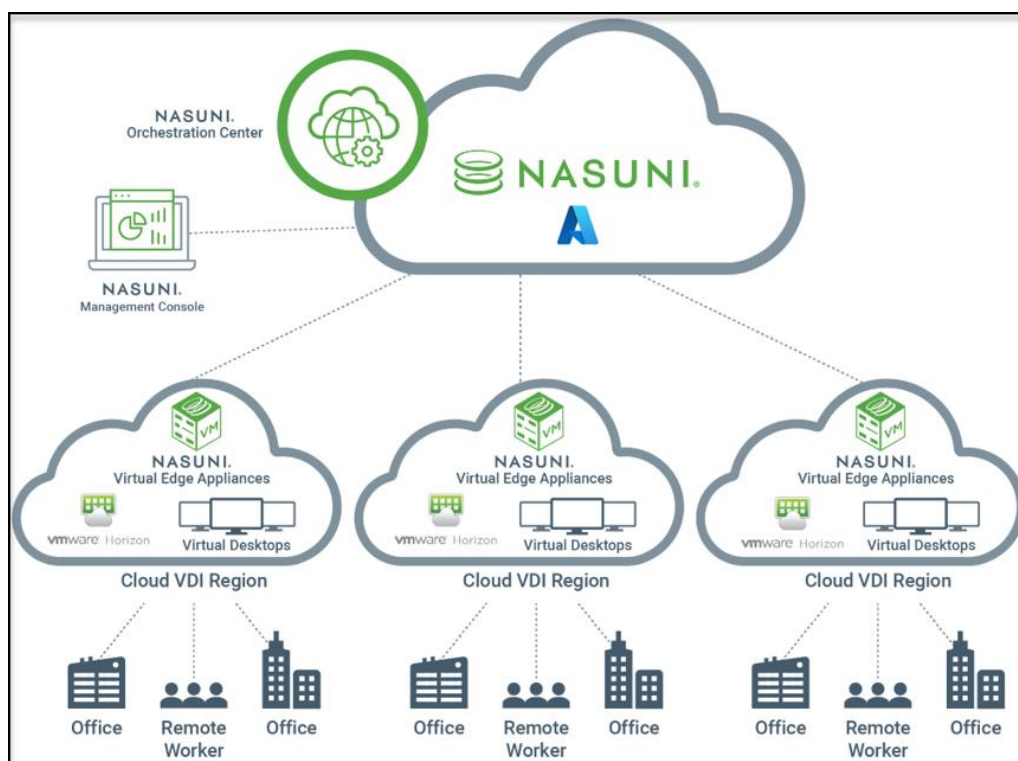

Figure 2: Horizon on Azure VMware Solution Overview.

Once file shares are consolidated by Nasuni in Azure Blob object storage, Nasuni Edges can be deployed as Azure virtual machines in the same Azure regions as VMware Horizon desktops to deliver economical, high-performance file access to a single global namespace. Since the file shares presented by each Nasuni Edge VM are co-located in the same Azure datacenter as the Horizon virtual desktops, Horizon users will experience a "local," high-performance file-sharing experience.

Nasuni Continuous File Versioning technology takes frequent snapshots of file system changes on every Nasuni Edge VM and stores them as immutable versions in Azure Blob object storage. With recovery points as often as every few minutes, and no limit to the number of snapshots that can be retained, the cost and complexity of file backup is eliminated, protection against ransomware is greatly improved, and IT resources can be freed up for other IT projects.

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Architectural Overview

Nasuni for VMware Horizon on AVS

Azure VMware Solution allows you to create vSphere Software-Defined Data Centers (SDDCs) on Azure. These are also referred to as Azure VMware Solution Private Clouds. Throughout this document, we will use the term SDDC. These SDDCs (Azure VMware Solution Private Clouds) include VMware vCenter Server for VM management, VMware vSAN™ for storage, and VMware NSX® for networking. You can connect an on-premises SDDC to a cloud SDDC and manage both from a single VMware vSphere Web Client interface.

Azure VMware Solution (AVS) is a native Azure service that integrates with Azure's broad ecosystem of services, including DR, Backup, Azure Active Directory, Azure management and security services, Azure Cognitive Services, and more.

After you have deployed an SDDC on Azure VMware Solution, you can add this SDDC as capacity to your Horizon Connection server to run your VDI workloads, such as desktops or RDSH hosts. This enables Horizon customers to outsource the management of the SDDC infrastructure to Microsoft. There is no requirement to purchase new hardware, and you can use the pay-as-you-go option for hourly billing on Azure VMware Solution.

The SDDC compute component is used to run the virtual desktop machines, for VDI and RDS Hosts, for published applications and shared desktops.

Nasuni Platform Components and Placement Considerations

The Nasuni File Data Platform consists of the following components:

UniFS®
Nasuni's cloud-native global file system stores all files, file versions, and metadata in your preferred cloud object storage. UniFS is the first file system designed to have its inode structure reside natively in the cloud, which enables the Nasuni platform to inherit the virtually unlimited capacity, durability, and georedundancy of cloud object storage**.**

> *Tip*: Since VMware Horizon on AVS is an Azure-based solution, we recommend using an Azure Blob storage account located in the same Azure region as your VMware Horizon on AVS deployment to instantiate UniFS and serve as your back-end repository for Nasuni. We also recommend using Azure Blob Cool (not Hot) as the storage performance tier; since copies of active file data will be cached on Nasuni Edge instances and presented to the Horizon virtual desktops through SMB (CIFS) file shares, there is no reason to pay extra for a faster tier of object storage**.**

Nasuni Edge Instances
The Nasuni Edge is a virtual machine that replaces traditional file servers and NAS devices. Nasuni Edges:

- Store all new files and file changes made by users and applications in your Azure Blob object storage account.
- Cache copies of actively used files from Azure Blob object storage to provide high-performance file access through standard SMB and NFS file-sharing protocols.

Each Nasuni Edge must be configured with enough Azure Disk storage to cache copies of the actively used files, which typically ranges from 2-5 percent of total file share capacity, depending on how many users will concurrently access the file shares and how active the data is. Because each Nasuni Edge is merely a lightweight access point to the global file system in Azure Blob storage, Azure VMware Solution with Nasuni can tap the unlimited capacity of Azure Blob storage to store any amount of file data.

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> *Tip*: For better scaling, locate the Nasuni Edge virtual machines in Azure, and not within the SDDCs.

Nasuni Management Console (NMC)
The Nasuni Management Console enables you to monitor and manage many Nasuni Edge instances from one central web-based management tool. Using the NMC, you can view the status of all your managed Nasuni Edges, as well as configure their settings to ensure consistency.

> *Tip*: Locate the Nasuni Management Console virtual machines in Azure, and not within the SDDCs.

Nasuni Orchestration Center (NOC)
The Nasuni Orchestration Center (NOC) is the control path for Nasuni file synchronization, global file lock, and platform management. This behind-the-scenes cloud service is included with and automatically maintained by Nasuni, and oversees security patches, component updates, system scaling, performance tuning, response time monitoring and analysis, optimization, staging and deployment of new software, support of new Nasuni Edge functionality, single sign-on management, cloud provisioning, cloud monitoring, account management, and customer support.

VMware Horizon Management Components

To allow scaling beyond a single SDDC, the recommended deployment of Horizon in Azure VMware Solution locates the management components in Azure and not within the SDDCs. By locating the management components outside of the SDDC, only network traffic intended for a particular SDDC is routed towards that SDDC.

This includes the following management components:

- Horizon Connection Servers
- Unified Access Gateway appliances
- VMware App Volumes™ Managers Load balancer
- Horizon Cloud Connector
- Nasuni Edge VMs to provide file shares for user data
- VMware Dynamic Environment Manager™ configuration
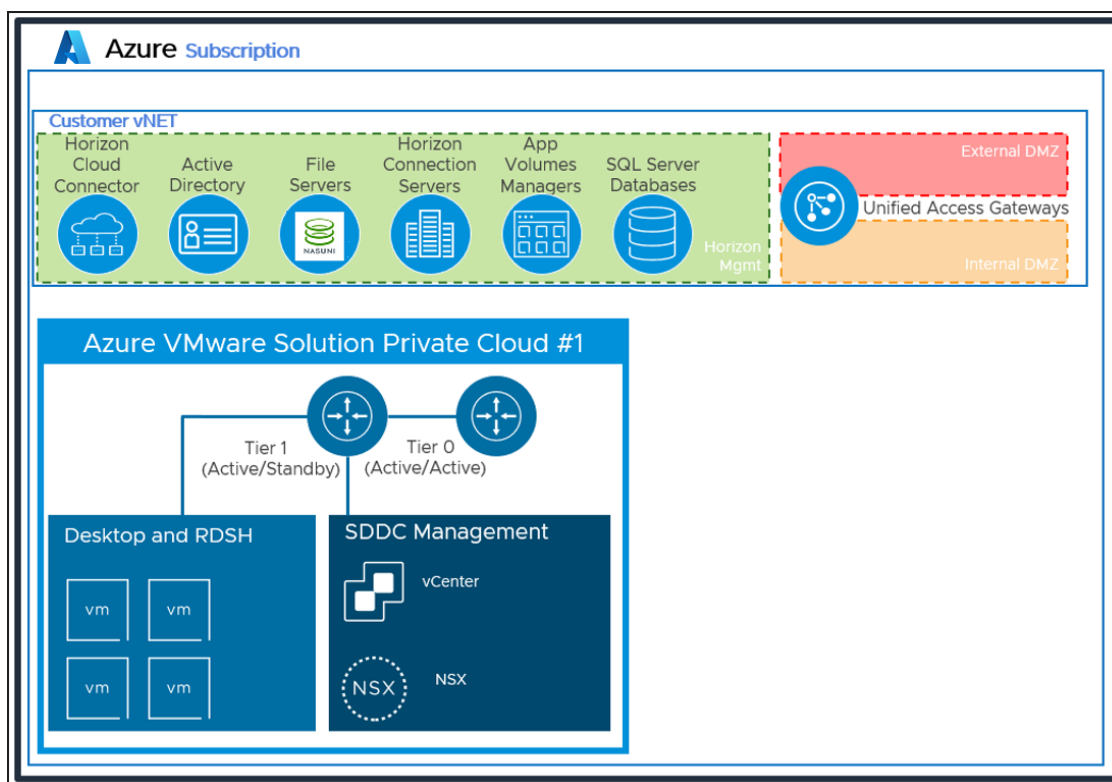- Database Server for App Volumes and Horizon events

Figure 3: Nasuni Edge VMs, like other VMware Horizon components, should be in Azure and not within an individual SDDC for effective scaling.

Scaling Deployments

A key concept of Horizon, whether deployed on Azure VMware Solution or on-premises, is the use of blocks and pods.

You can use Cloud Pod Architecture (CPA) to federate multiple Horizon pods either in the same location or across different locations, to unite management and user consumption. CPA introduces the concept of a global entitlement (GE) through joining multiple pods together into a federation. This feature allows you to provide users and groups with a global entitlement that can contain desktop pools or RDSH-published applications from multiple different pods that are members of this federation construct.

You can deploy Horizon in a hybrid cloud environment when you use CPA to federate Horizon on-premises pods and Horizon on Azure VMware Solution pods. You can also stretch CPA across two or more Azure VMware Solution data centers.

Note that, when using multiple data centers, Nasuni eliminates the need to use a replication mechanism, such as DFS-R, for replicating and sharing file shares and user data. You can simply deploy a Nasuni Edge VM in each data center, where you must provide the same file shares. Nasuni's hub-and-spoke architecture automatically keeps all Nasuni Edges in each data center synchronized so that the most current versions of all files are presented across all pods.

Nasuni does this by first snapshotting a file change made on one Nasuni Edge to Azure Blob object storage, and updating the authoritative "gold" copy of the file to this new version. Then, the change is automatically

propagated to all other Nasuni Edge VMs in other data centers that are presenting the same file. Nasuni Global File Lock helps prevent version conflict by ensuring that only one VMware Horizon desktop user at a time across all pods and data centers can open a file for writing.

The use of Horizon CPA is optional. You can choose to deploy Horizon exclusively in a single Azure VMware Solution data center without linking it to any other Horizon pod. For more details, see the Cloud Pod Architecture section in VMware's Horizon Architecture documentation.

In the remainder of this section, we will discuss options for scaling out Horizon on AVS with Nasuni for file data services.

Single SDDC

In a single SDDC deployment, it is recommended to locate the Horizon Management components in the Azure vNet, outside of the SDDC. This allows easier future scaling of capacity through the addition of more SDDCs to the pod, without having to relocate the management components.

Nasuni Edge VMs, like other Horizon Management components, should be located outside of the SDDC in the Azure vNet. The Nasuni Edge will cache copies of actively used file data from Azure Blob object storage and present the data through SMB file shares to the Horizon desktops. By locating the Nasuni Edge in the Azure vNet instead of inside the SDDC, other SDDCs can connect to it and access the same file shares.
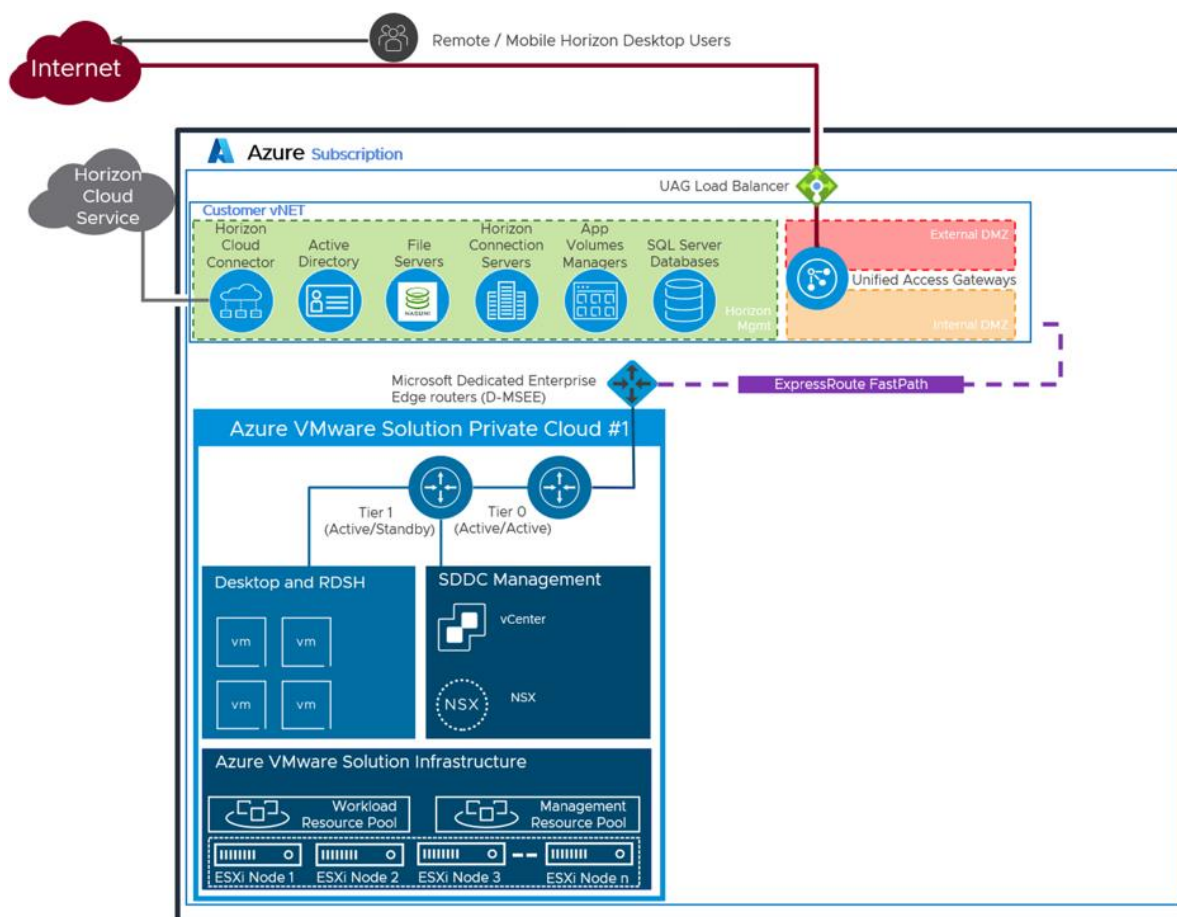

Figure 4: In a single SDDC deployment, Nasuni Edge VMs should be in Azure and not within an individual SDDC for effective scaling.

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Single SDDC with Connection to VMware Horizon On-Premises

If you already have an on-premises VMware Horizon environment, you can scale out this environment by adding one or more SDDCs on Azure VMware Solution and forming a new Horizon Pod.

Nasuni Edge VMs can be deployed in the on-premises SDDC to present the same file shares as the Nasuni Edge VM in the Azure SDDC. Both Nasuni Edge instances can cache copies of the same file data from Azure Blob object storage and present the same global file system so that Horizon desktops in the Azure SDDC and on-premises SDDC can seamlessly share the same files. Nasuni will automatically keep both Nasuni Edges in sync with each other as files are added or changed so that Horizon virtual desktop users in both SDDCs are always accessing the most recent version of any shared file. Nasuni Global File Lock® helps eliminate version conflict by ensuring that only one Horizon virtual desktop user at a time in either SDDC can open a shared file for editing.
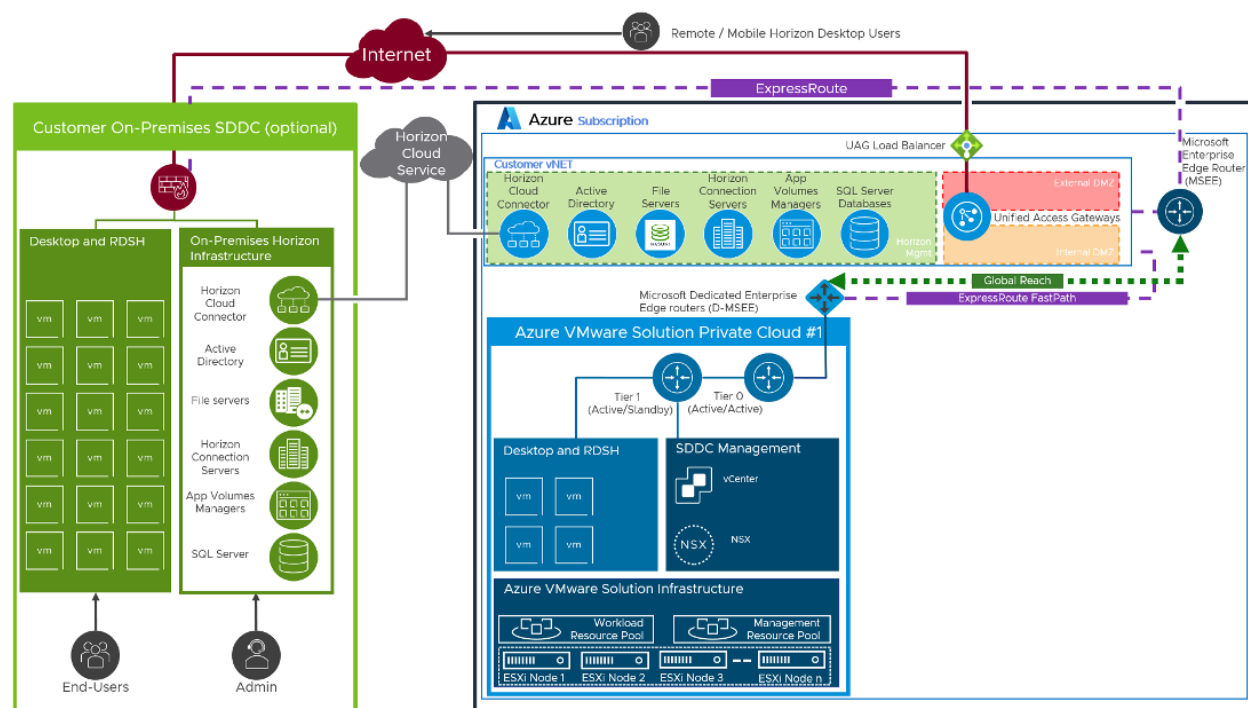

Figure 5: To connect to an existing VMware Horizon deployment on-premises and present the same file shares to Horizon desktops in both the Azure SDDC and on-premises SDDC, simply deploy another Nasuni Edge VM in the on-premises SDDC. Nasuni will keep both Nasuni Edges in sync so that Horizon virtual desktop users in both SDDCs are always accessing the most recent version of any shared file.
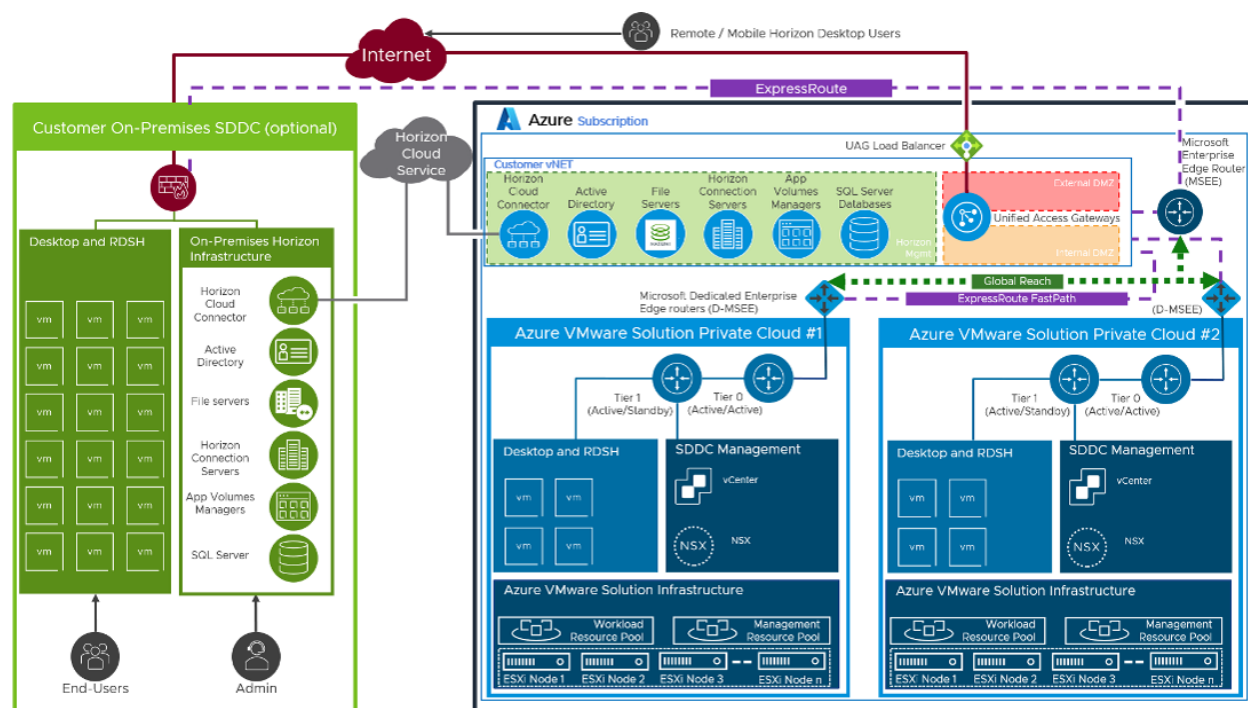
Multiple SDDCs

An existing Horizon Pod based on AVS can be extended with multiple SDDCs to scale the pod out.

Each SDDC uses an ExpressRoute with FastPath circuit to connect the SDDC to the vNet. A connection to an on-premises or co-location site also uses an ExpressRoute circuit. Currently, you can link a single virtual network (vNet) with up to four ExpressRoute circuits in either the same or different peering locations.

You can extend beyond a single Horizon Pod by creating separate Horizon Pods in new Azure vNets. The vNets and Horizon Pods can be in the same Azure region or in different Azure regions.

Nasuni Edge VMs, like other Horizon Management components, should also be located outside of the SDDCs in the Azure vNet. The same Nasuni Edge VM can be accessed by SDDC 1 and SDDC 2, or additional Nasuni Edge VMs can be deployed in the Azure vNet for load balancing and performance reasons. Nasuni will automatically keep all Nasuni Edges in sync with each other as files are added or changed so that Horizon virtual desktop users in both Azure SDDCs are always accessing the most recent version of any shared file.

Figure 6: In a multiple SDDC deployment, Nasuni Edge VMs should be in Azure and not within an individual SDDC for effective scaling. Additional Nasuni Edges can be added as needed in the Azure vNet to scale file share performance, and each will be automatically kept in sync so that Horizon virtual desktop users in both Azure SDDCs are always accessing the most recent version of any shared file.

Sizing Nasuni Edges

Nasuni Edge virtual machines (also referred to as "appliances") should be sized for the expected peak load in terms of the number of concurrent users since sizing for the expected average load of concurrent users could result in performance issues during peak periods.

The number of active VDI users determines how many Nasuni Edge Appliances are required. Another factor is the cache size for each Nasuni Edge Appliance. The cache should be large enough to store copies of active file data from Azure Blob object storage, as well as all the associated metadata. Generally, the cache disk size ranges from 2-5 percent of total file share capacity, depending on how many users will concurrently access the file shares and how active the data is.

For further information on this topic, see Nasuni Edge Appliance Administration Guide.

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Load Balancing for Nasuni Edges

Nasuni Edge VMs running on Microsoft Azure can be used as back-end pool instances with Azure Load Balancer. Client SMB traffic can then be directed to the Azure Load Balancer to distribute client load, and help to mitigate against Edge Appliance outages by redirecting client connections away from failed or offline instances.

Azure Load Balancer load-balancing rules are defined based on the inbound port only, allowing for increased transparency, but limiting the control available to the operator in defining how flows will be routed. Azure Load Balancer can be used to increase Nasuni Edge availability to downstream clients for some use cases. For a detailed enumeration of supported configurations, see Understanding Azure load balancing. For detailed information of firewall rules, see Firewall and Port Requirements.

Licensing

Enabling Horizon and Nasuni to run on Azure VMware Solution requires three separate licenses:

1. A capacity license for Azure VMware Solution.
2. A Horizon subscription license.
3. A Nasuni subscription license.

For a POC or pilot deployment of Horizon and Nasuni on Azure VMware Solution, you can use a temporary evaluation license or your existing perpetual license.

To enable Horizon and Nasuni for production deployment on Azure VMware Solution, you must purchase Horizon and Nasuni subscription licenses. To obtain a Horizon subscription license, or for more information on how to upgrade your existing perpetual license to a subscription license and associated discounts, contact your VMware representative. To obtain a Nasuni subscription license, contact your Nasuni representative.

Sample Reference Architecture

A large financial services firm is deploying VMware Horizon on AVS to serve as the Disaster Recovery site for its two on-premises deployments of VMware Horizon. Each on-premises data center deployment of VMware Horizon supports 2,000 users, so a single 2,000 user deployment of VMware Horizon in AVS was chosen to enable one data center to fail over to the cloud at a time.

The firm is deploying the 2,000 VMware Horizon non-persistent virtual desktops in AVS evenly distributed across 2 pods, with Nasuni providing 300 TB of total usable file share capacity. Two Nasuni Edge VMs are being deployed in Azure – each serving 1,000 users – to provide SMB-based access to the file data. An Azure Blob storage account has been created in the same Azure region as the virtual desktops to serve as Nasuni's back-end repository for all file data. The two Nasuni Edge VMs are also being deployed in the same Azure region to eliminate Azure data egress fees and ensure fast retrieval of any file data that is not in cache.

The configuration of each Nasuni Edge VM in Azure is as follows:

*   D48s v4: 48 vCPUs, 192 GB RAM, 0 GB Temporary storage, 3 year reserved, Linux.
*   2 Managed P50 Premium SSD: 4096 GiB, 7500 IOPS, 250 MB/sec, 3 year reserved. The 2 P50 SSD provide 8 TB of cache for each Nasuni Edge, which will support up to 150 TB of total file share capacity for each Horizon pod.

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Important: It was mentioned earlier that each Nasuni Edge should be configured with enough Azure Disk storage to cache copies of the actively used files. Cache size typically ranges from 2-5 percent of total file share capacity, depending on how many users will concurrently access the file shares and how active the data is. 8 TB is 5 percent of 150 TB, which is in keeping with these guidelines.

The configuration of the Azure Blob storage account that will be used by Nasuni to store all file data, metadata, snapshots, and system state is as follows:

- Block Blob Storage, LRS Redundancy, Cool Access Tier, 216 TB Capacity, 3 year reserved.

Important: Nasuni storage efficiency reduces the amount of Azure Blob storage needed to store file data by 40% for standard file services use cases. In this example, 300 TB of total file share data would be compressed and de-duplicated by Nasuni to 180 TB (40% of 300). But additional capacity is used by Nasuni to store file system snapshots every 5 minutes to enable this customer to rapidly recover data after a ransomware attack or file deletion, and eliminate the need for legacy file backup. The additional 36 TB of estimated snapshot capacity combined with the 180 TB of file data storage adds up to the 216 TB of Azure Blob reserved capacity in the above configuration.

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