Microsoft

AZ-801

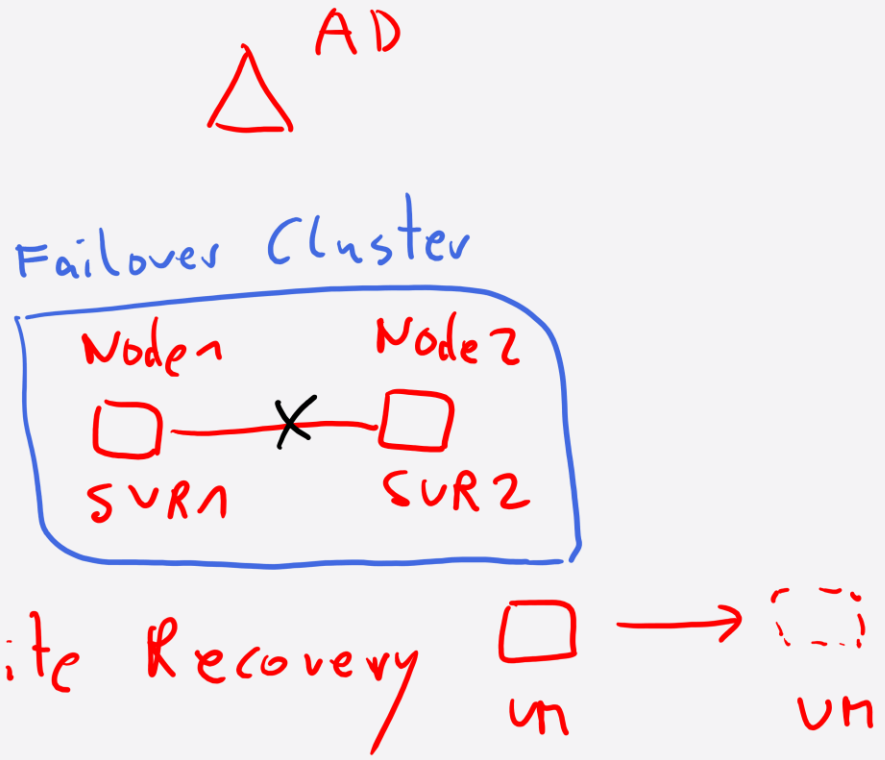
Configuring Windows Server Hybrid Advanced Services

3 Failover Cluster

Guten Morgen!

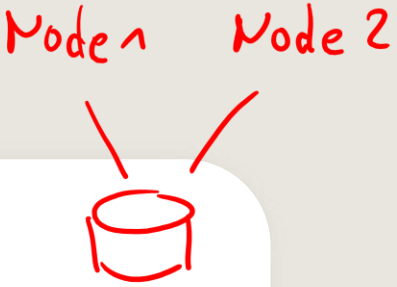
AZ-801 Course Outline

1. Windows Server Security on Prem
2. Windows Server Security Cloud
3. Failover Cluster
4. Disaster Recovery on Prem
5. Disaster Recovery Cloud
6. Windows Server Upgrade and Migrate
7. Migrate Windows Server to Cloud
8. Windows Server Monitoring
9. Monitoring in the Cloud



MMA
AMA
DCR
Data Collection Rule
LA Workspace

Implementing Windows Server high Availability



- Introduction to Cluster Shared Volumes
- Implement Windows Server failover clustering
- Implement high availability of Windows Server VMs
- Implement scale and high availability with Windows Server VM
- Implement Windows Server File Server high availability
- Lab 03: Implementing failover clustering

Introduction to Cluster Shared Volumes

Determine the Functionality of Cluster Shared Volumes

Concept of CSV

- CSV is a general-purpose clustered file system.
- It enables cluster nodes to simultaneously read from and write to the same set of NT File System (NTFS) or Resilient File System (ReFS) volumes.
- CSV consolidates volumes hosted on disks connected to cluster nodes into a single namespace.
- Allowing concurrent volume access

CSV supports two main types of workloads:

- Clustered Microsoft Hyper-V VMs (including their virtual hard disk (VHD) files)
- Scale-out file shares hosting application data for the Scale-Out File Server (SOFS) clustered role.
- General Use FS

Clustered Shared Volumes Architecture

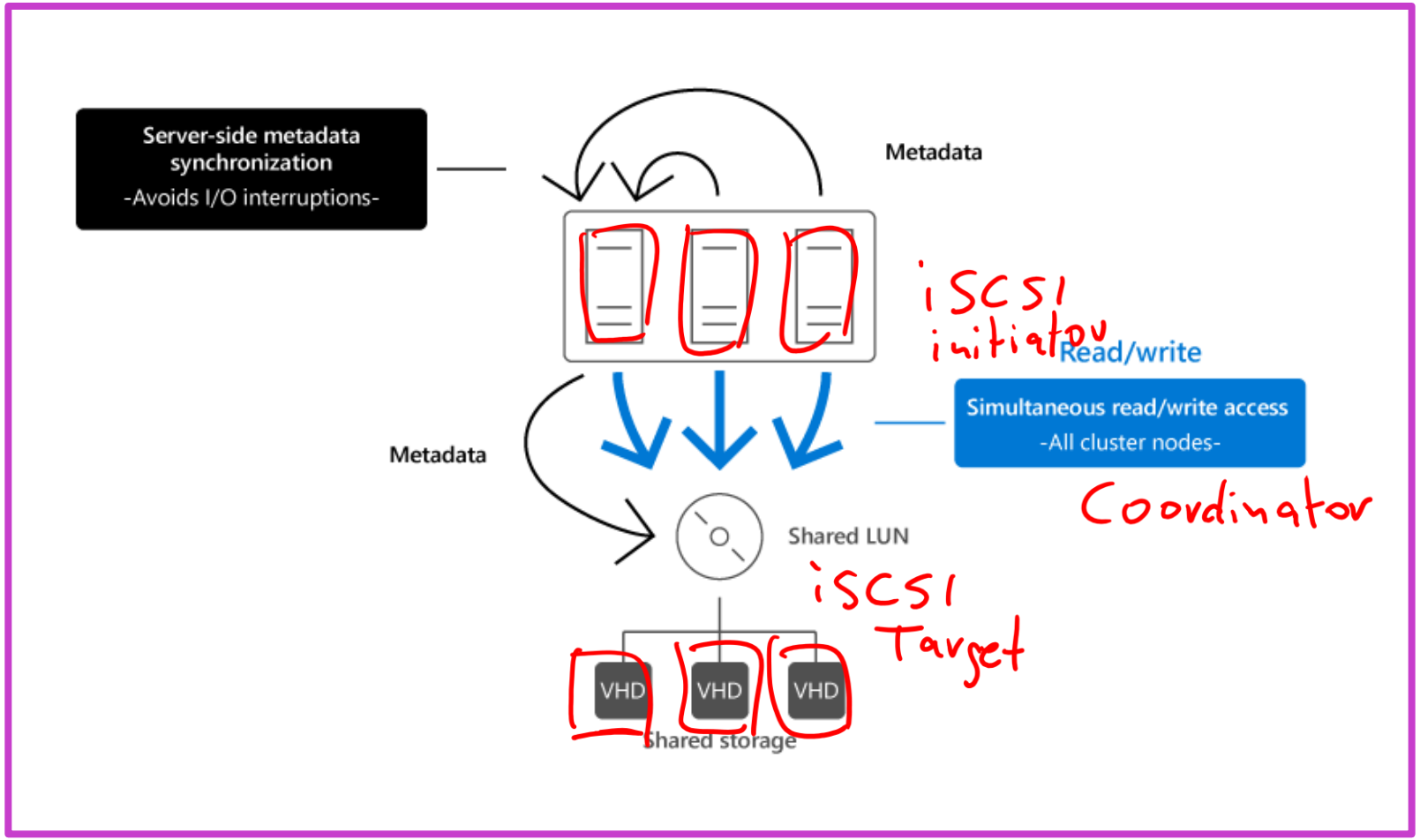
CSV consists of shared volumes mapped to subdirectories within the C:\ClusterStorage\ directory on each cluster node

CSV Volume Manager makes sure that the CSVs are presented as local volumes

Standard write and read operations to open files on a CSV volume doesn't affect metadata

CSV supports two I/O redirection modes:

- File system redirection
- Block redirection



Implement Cluster Shared Volumes

Plan for CSV

To use CSV, your storage and disks must satisfy the following requirements:

- File system format and disk configuration
- Physical Disk cluster resources.

Additional planning considerations include:

- The number and size of Logical Unit Numbers (LUNs) and volumes
- The number and size of VMs
- Cluster networks

Implement CSV

- The CSV feature is enabled by default
- You can implement CSV by using Failover Cluster Manager or Windows PowerShell cmdlets.
- You should configure CSVs before you make any VMs highly available

Implement Windows Server failover clustering

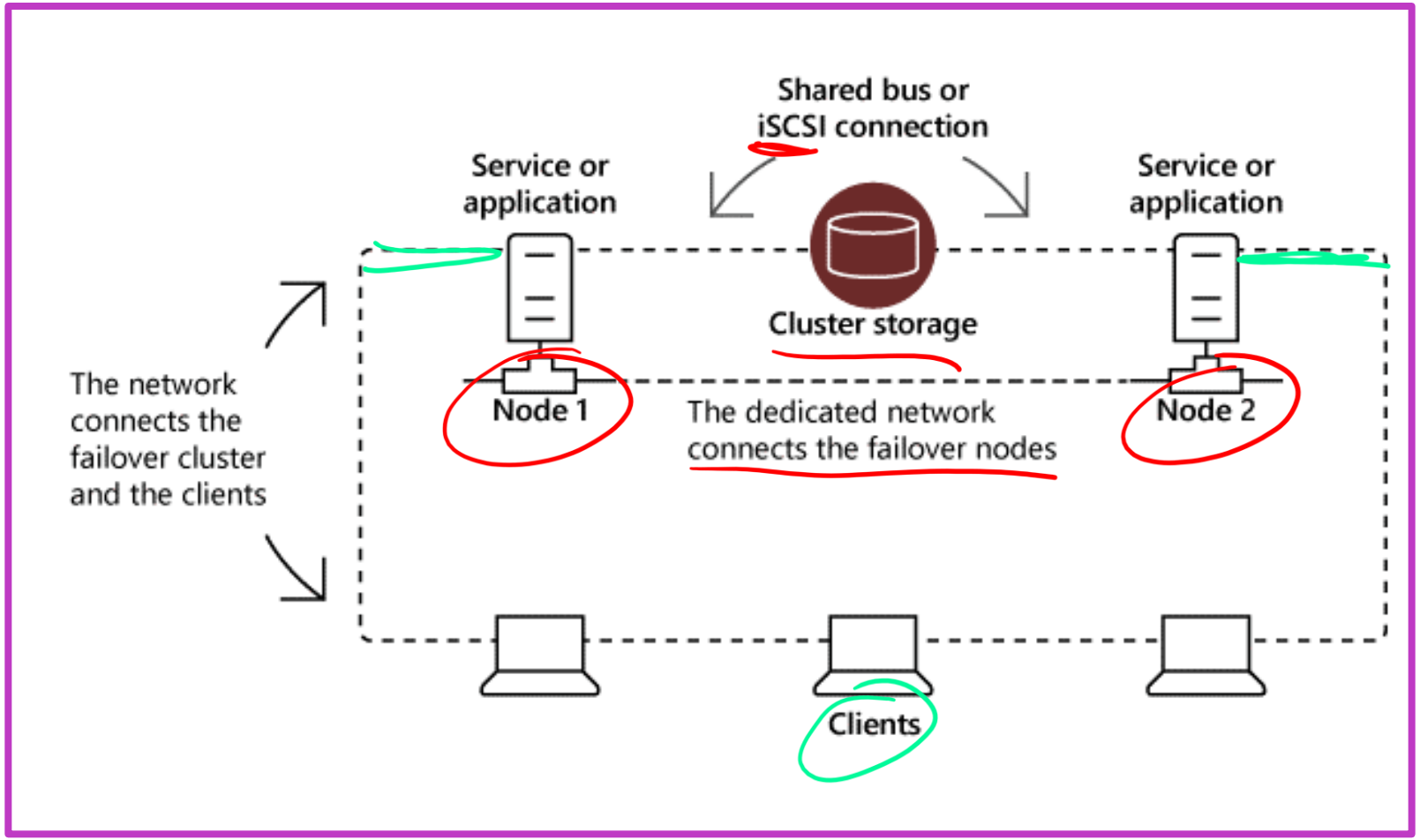
Overview of Failover Clustering

Windows Server failover clustering provides high availability of common Windows-based workloads, including:

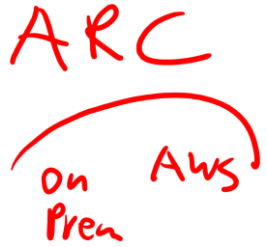
- File shares,
- Virtual machines (VMs)
- Database management systems
- Messaging services.

Failover clustering components:

- Nodes
- Clients
- Networks
- Clustered role
- Resources
- Cluster storage



Define Windows Server Failover Clustering



Failover clustering functional levels – Windows Server failover clustering capabilities depend on the cluster's functional level.

Failover clustering quorum – Represents the number of clustering components. The quorum is determined based on the number of votes; the quorum model defines allocation of votes.

Failover clustering witness types – Three types of quorum witness available to failover clustering:

- Disk Witness uses a clustered disk resource in the same failover cluster.
- File Share Witness uses an external file share.
- Cloud Witness uses a blob in an Azure Storage account.

Plan Windows Server Failover Clustering

Failover cluster planning considerations

- Failover clustering workloads
- Failover clustering capacity
- Failover clustering resiliency
- General hardware recommendations and requirements
- Networking requirements
- Infrastructure requirements
- Software requirements for a failover cluster implementation

Implementing Windows Server Failover Clustering

1. **Failover cluster validation –** You should run validation tests whenever you make any major configuration changes

2. **Create a failover cluster –** You can create a failover cluster by using the Failover Cluster Manager console or Windows Admin Center

3. **Configure quorum –** You can use the Configure Cluster Quorum Wizard to apply the recommended settings.

Manage Windows Server Failover Clustering

Manage cluster nodes

- Cluster node management tasks include the following actions:
  - **Add a node.** Adding add a node to a failover cluster
  - **Pause a node.** Pausing a node to prevent resources from failing over or moving to the node
  - **Evict a node.** Node can be evicted when it fails or when it's no longer needed in the cluster

Monitor cluster events with Event Viewer

- Use Event Viewer to examine events with the Critical, Error, or Warning severity level.

Deploy updates to cluster nodes

- With Cluster-Aware Updating (CAU) in Windows Server, you can automate deployment of updates to cluster nodes without downtime.

Overview of Storage Replica

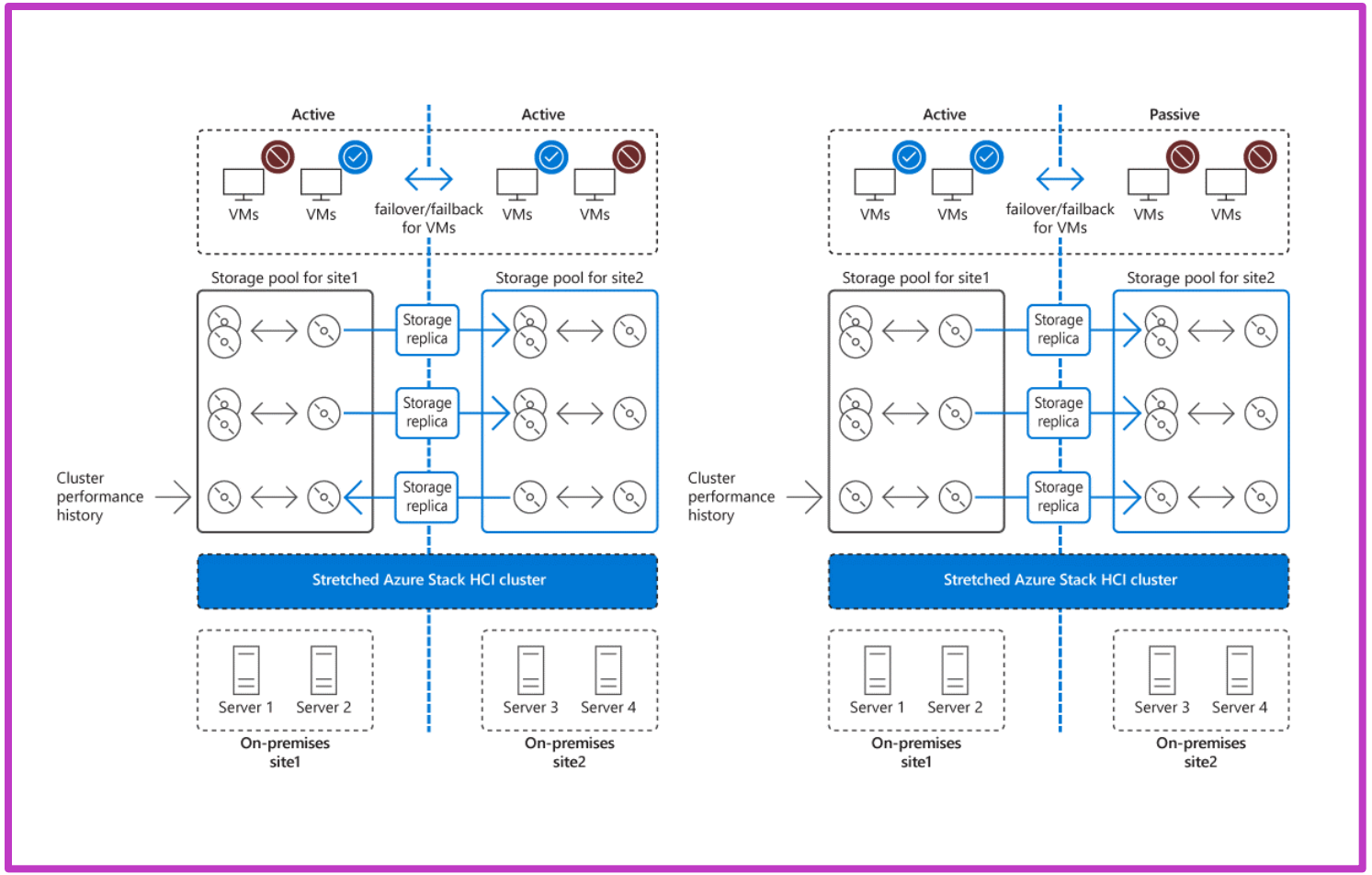
What are stretch clusters?

A stretch cluster implements high availability and disaster recovery across two separate physical locations.

Storage Replica supports synchronous and asynchronous replication,

The main features of Storage Replica are:

- Block-level replication
- Simplicity
- Use of Server Message Block (SMB) 3.0
- Security
- Network constraints
- Thin provisioning



Implement Stretch Clusters

Prerequisites for deploying stretch clusters nodes:

- Members of the same domain and running Windows Server 2019/2016 Datacenter edition
- Minimum 1 Gigabit Ethernet adapter for synchronous replication with enough bandwidth to match I/O writes of the clustered workloads and less than 5-ms round-trip latency.
- Two sets of volumes at the primary and the secondary site
- Disks must be initialized as GUID Partition Table (GPT), rather than master boot record (MBR).
- Bi-directional connectivity via Internet Control ICMP, SMB and WS-MAN between the two sites.

Considerations for deploying a stretch cluster

- Aren’t suitable for every workload and every scenario
- Impose more management overhead than traditional clusters
- Carefully consider the optimal choice of the quorum witness
- Clearly identify the organizational requirements and expectations

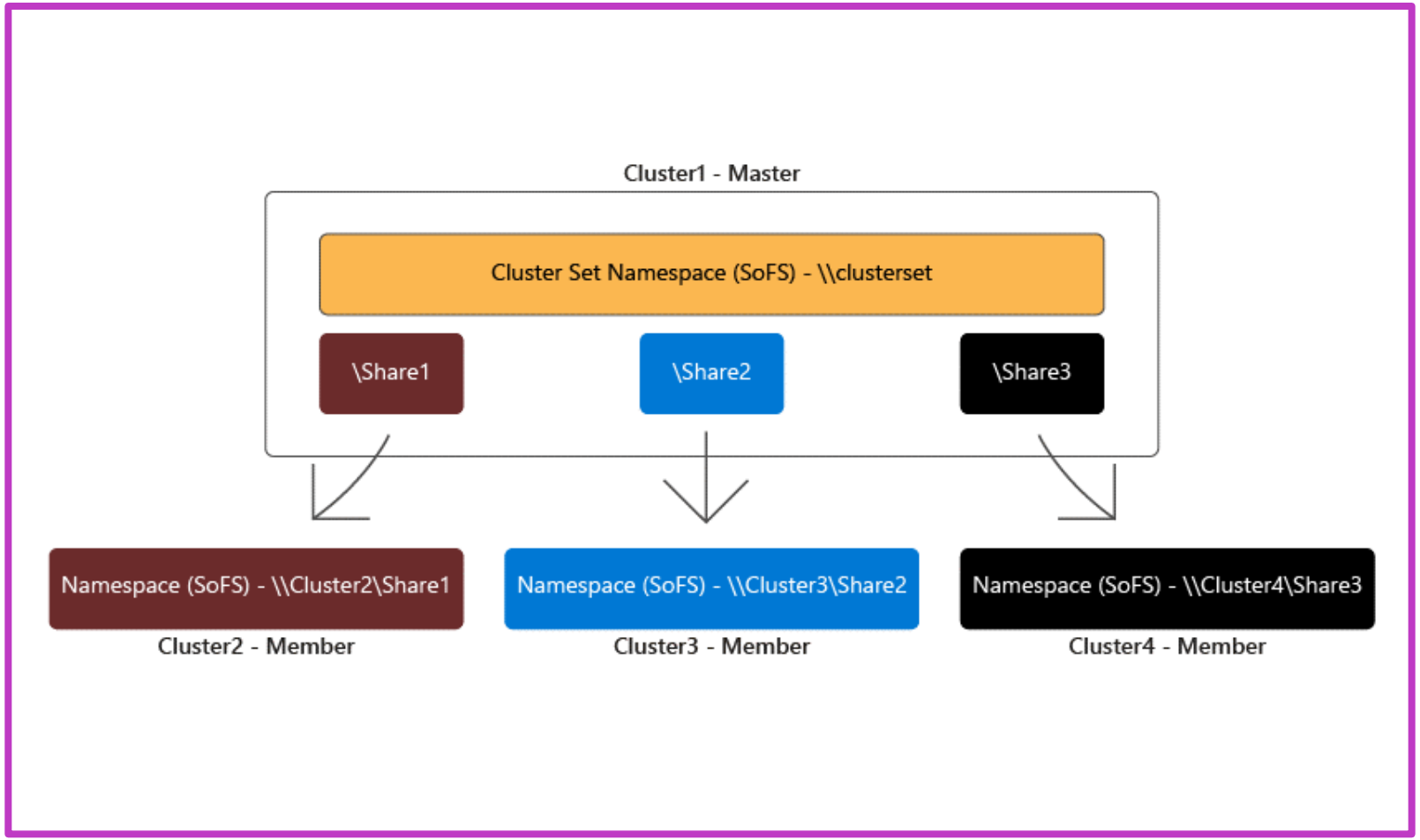
Define Cluster Sets

Cluster sets address two primary challenges associated with individual clusters:

- Availability
- Scalability

A cluster set consists of the following components:

- Management cluster
- Member clusters
- Cluster set namespace referral SOFS
- Cluster set master
- Cluster set worker



Implement high availability of Hyper-V Windows VMs

Select high-availability options for Hyper-V

What are high-availability options for Hyper-V VMs?

Implement VMs as a clustered role (host clustering).

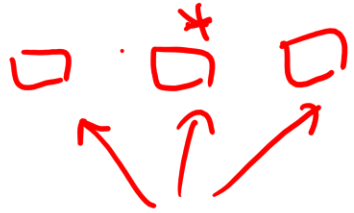
- Failover cluster consisting of nodes running the Hyper-V server role. In case the cluster node that hosts a highly-available VM fails unexpectedly, another node will automatically restart or resume that VM

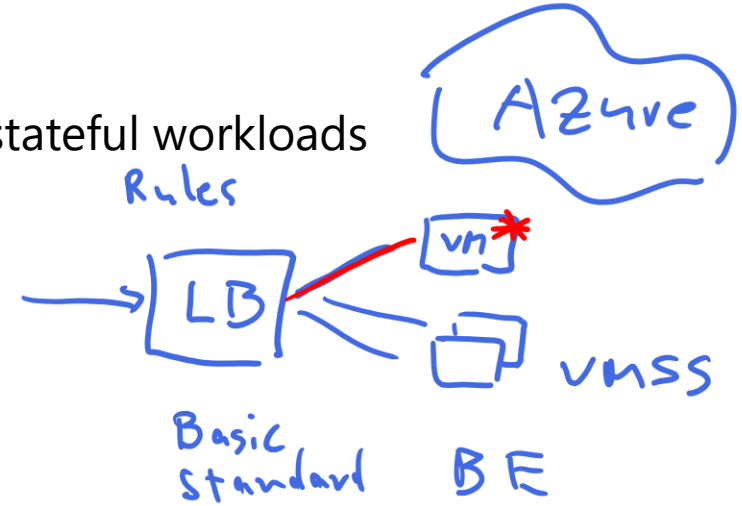
Implement clustering inside VMs (guest clustering).

- Provision two or more VMs and configure them as nodes of a failover cluster. This type of configuration is suitable only for a development or test environment.

Use Network Load Balancing (NLB) inside VMs.

- Windows Server failover clustering is optimized for high availability of stateful workloads





Consider Network Load Balancing for Hyper-V VMs

What is Hyper-V VMs NLB?

- NLB is a Windows Server operating system feature.
- NLB works with Hyper-V VMs in the same way as it does with physical hosts.
- NLB is a suitable solution for resources that don't rely on session state maintained by the server hosting the TCP/IP-based service.
- Alternatively, session state can reside in a back-end data store that all NLB cluster members can access.

Implement Hyper-V VM Live Migration

What is Hyper-V Live Migration?

Live Migration is a Hyper-V feature which allows you to seamlessly move running VMs from one Hyper-V host to another while maintaining the availability of VM workloads.

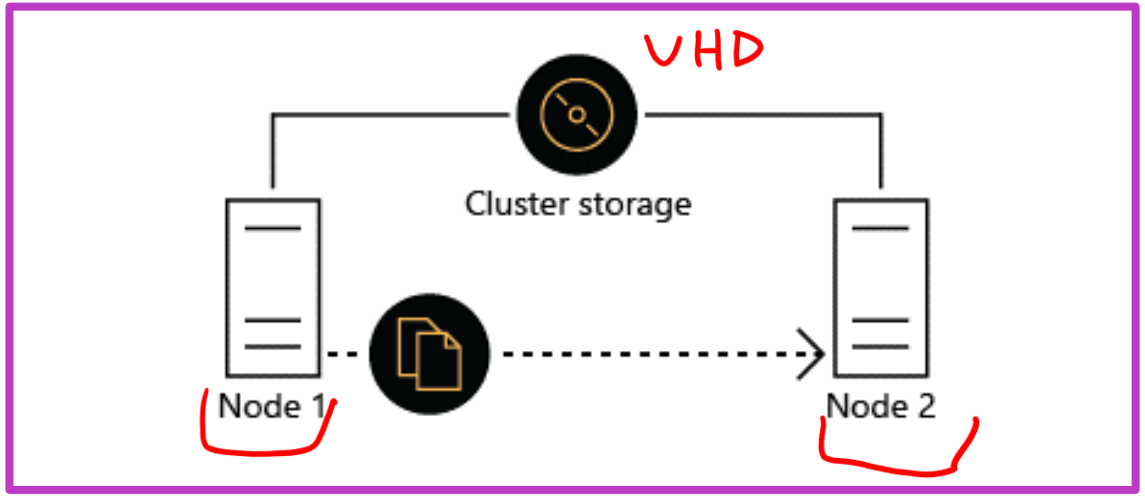
Implement Hyper-V Live Migration

You can start the live migration process by using:

- Windows Admin Center
- Failover Cluster Management
- Hyper-V Manager
- Windows PowerShell

How does Hyper-V Live Migration work?

- Migration setup
- VM memory transfer
- State transfer
- Cleanup



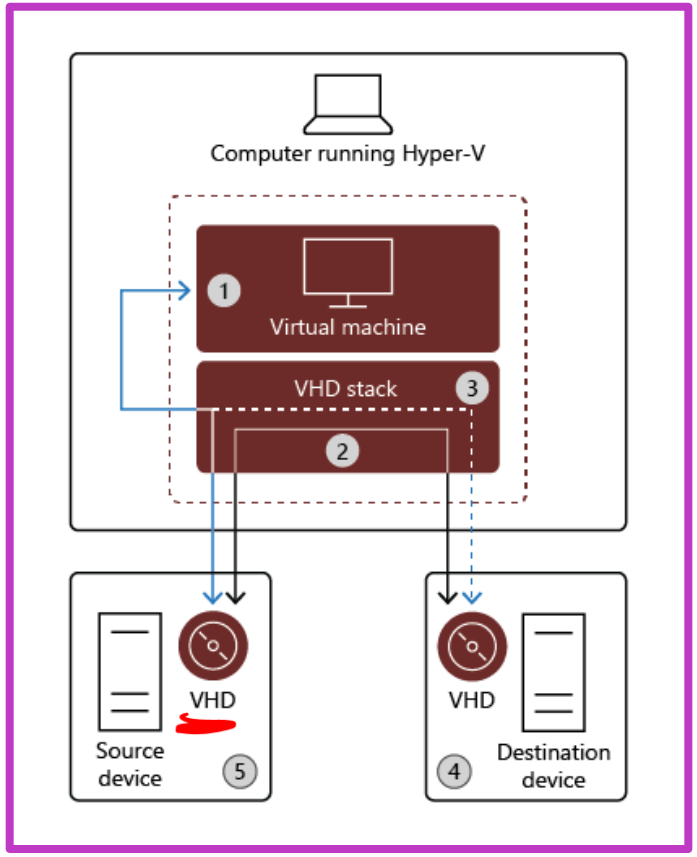
Implement Hyper-V VMs Storage Migration

What is VM storage migration?

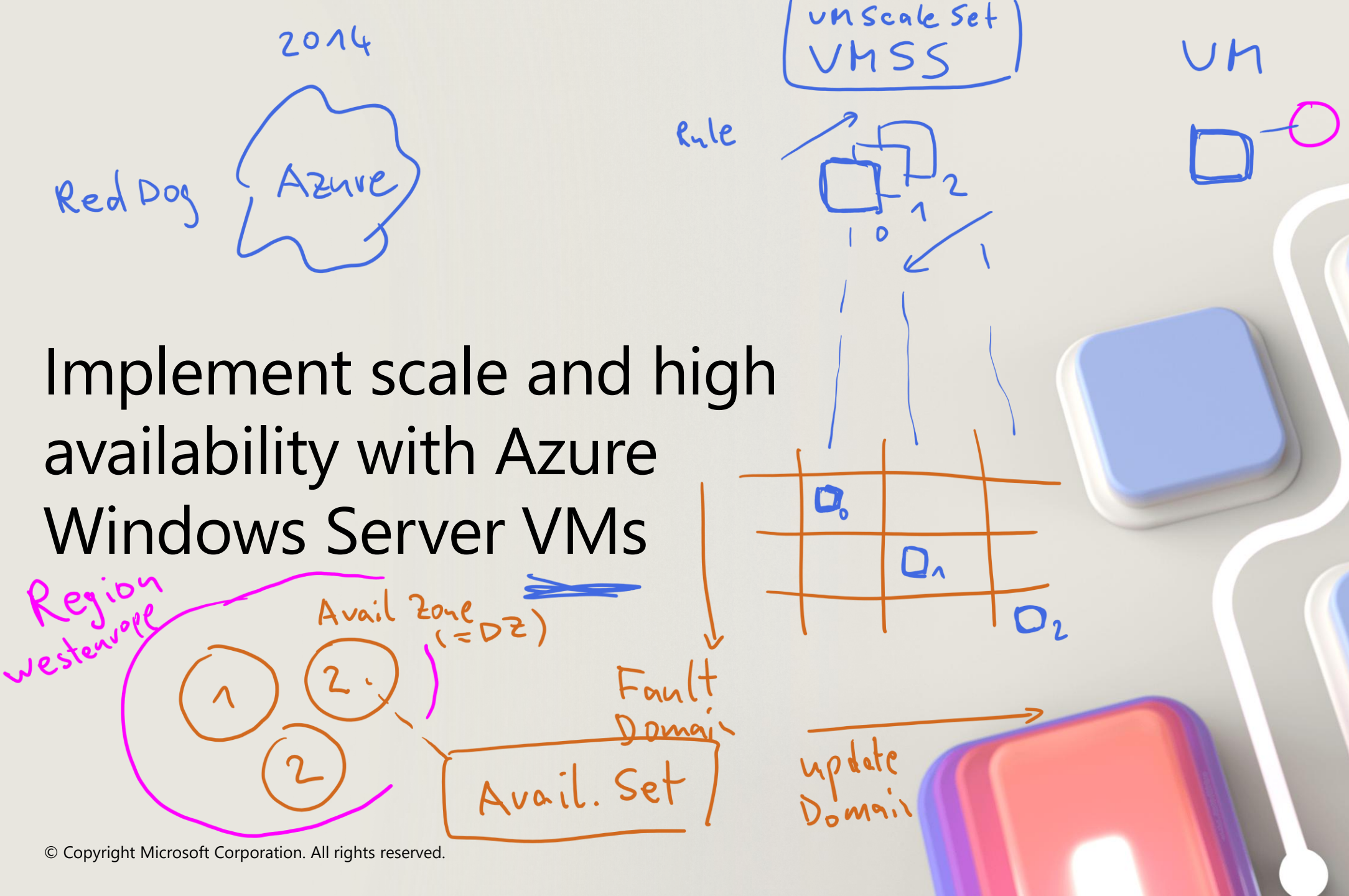
- With Hyper-V, you can use Live Migration to move VM disk files while the corresponding VM is running.
- You can perform this task by using the Live Migration Wizard in Hyper-V Manager or by using Windows PowerShell.

How does storage migration work?

- Move all the virtual machine's data to a single location.
- Move the VM's data to different locations. This allows you to specify individual locations for each VM component.
- Move only the virtual machine's hard disks (only VHD files).



Implement scale and high availability with Azure Windows Server VMs



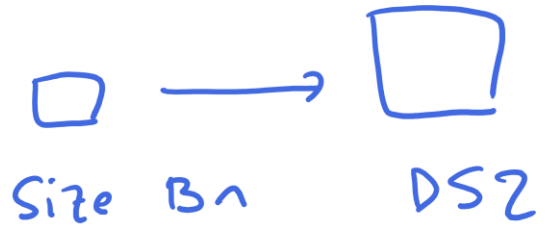
Describe Virtual Machine Scale Sets

What is a virtual machine scale set?

- Azure virtual machine scale sets enable you to deploy and manage multiple load-balanced, **identical VMs**.
- Virtual machine scale sets can respond to increases and decreases in demand by changing the number of VM instances, and also by changing the size of VM instances.
- A scale set uses a load balancer to distribute requests across the VM instances and a health probe to verify the availability of each instance.

Scaling options for scale sets

- **Horizontal** – The process of adding or removing VMs in a scale set. Depending on demand, you might need to add or remove machines in a scale set.
- **Vertical** – The process of increasing resource in your VMs, such as CPU, memory, or disk space. Vertical scaling focuses on increasing the size of the VMs in the scale set instead of adding additional VMs.



Implement Scaling

What is vertical scaling?

- Vertical scaling, also known as scale up and scale down, means increasing or decreasing VM sizes in response to a utilization.
- Removing an existing VM and replacing it with a new one is known as reprovisioning.

Vertical scaling requires restarting the affected VMs in the scale set.

What is horizontal scaling?

- Manual scale – With manual scaling, you maintain a fixed instance count and adjust it by using a manual slider when needed to address increases in demand.
- Custom autoscale – With custom autoscaling, you can scale on either a scheduled basis, by using metrics, or a combination of both.

Metrics Azure Monitor

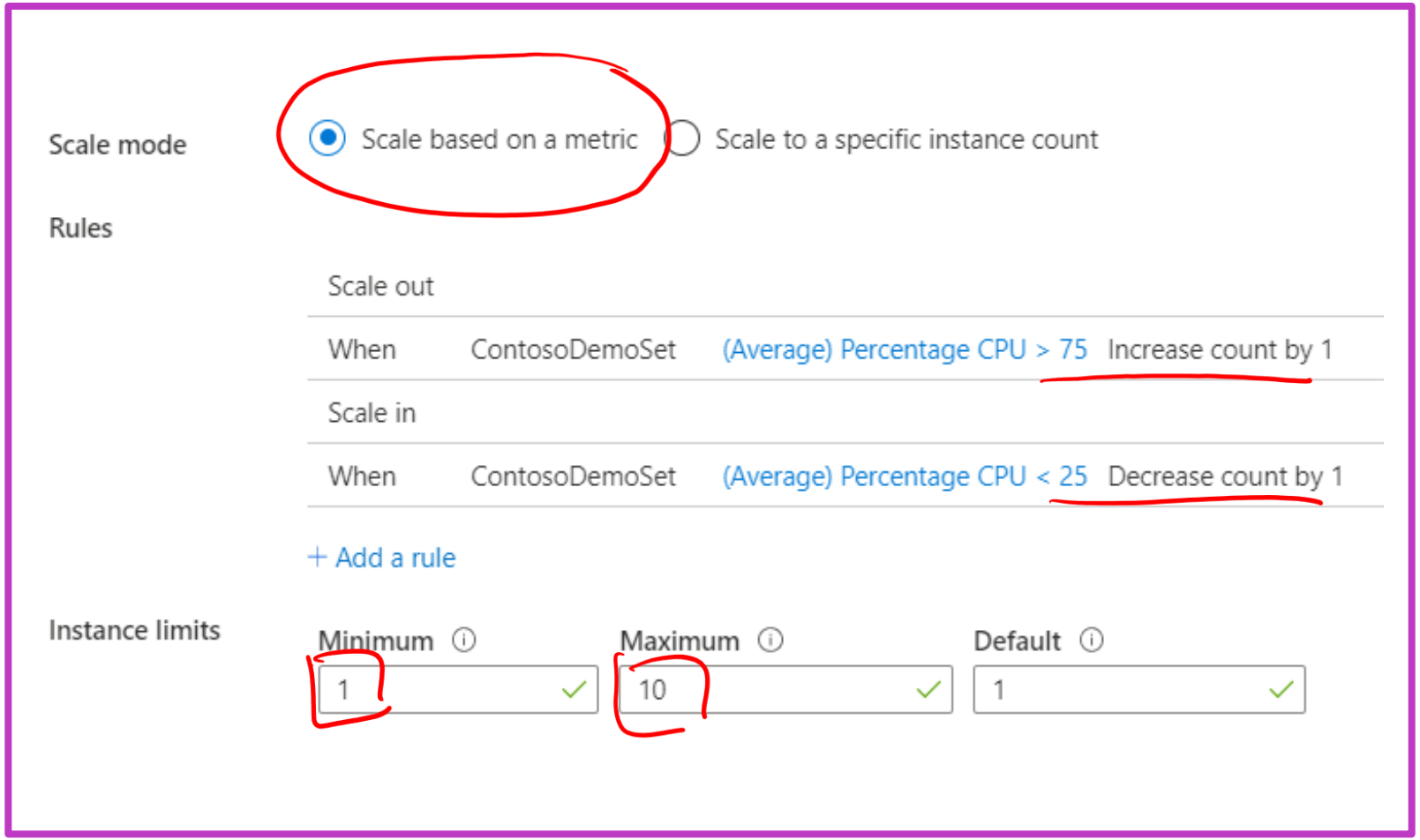
Configuring Custom Autoscale

Autoscale increases the number of VM instances as application demand increases.

It minimizes the number of unnecessary VM instances that run applications when demand is low.

Several host-based metrics are available for use when you create autoscale rules.

When an autoscale rule triggers, your scale set can automatically scale in or out.



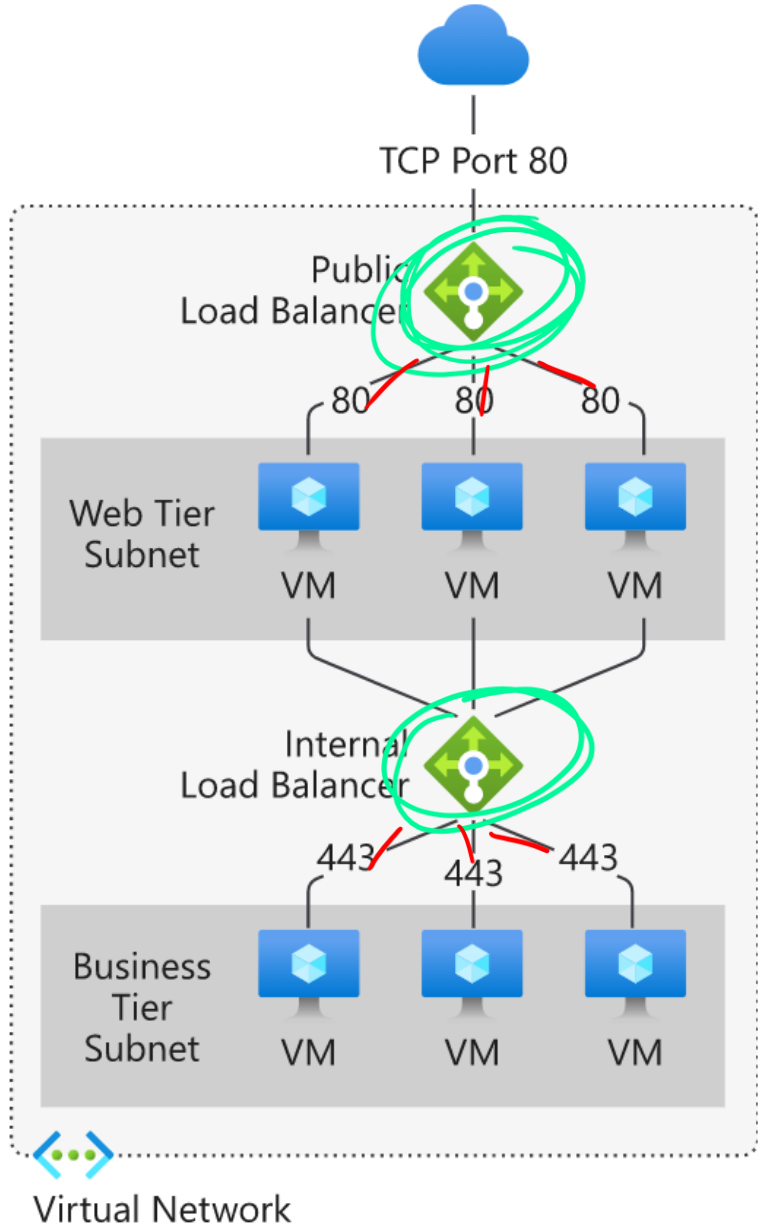
Implement load-balancing VMs

Public load balancer provides outbound connections for VMs inside your Azure virtual network (VNet) by translating their private IP addresses to public IP addresses. You use public load balancers to load balance internet traffic to your VMs.

Internal load balancer provisioned where private IPs are needed at the frontend only. You use internal load balancers to load balance traffic inside an Azure VNet.

Frontend IP configuration is set up with Public IP or Private IP addresses. The IP address of your Azure Load Balancer is the point of contact for clients

Backend pool can be associated to Azure VMs or virtual machine scale set. VMs in the backend pool serve the incoming requests.



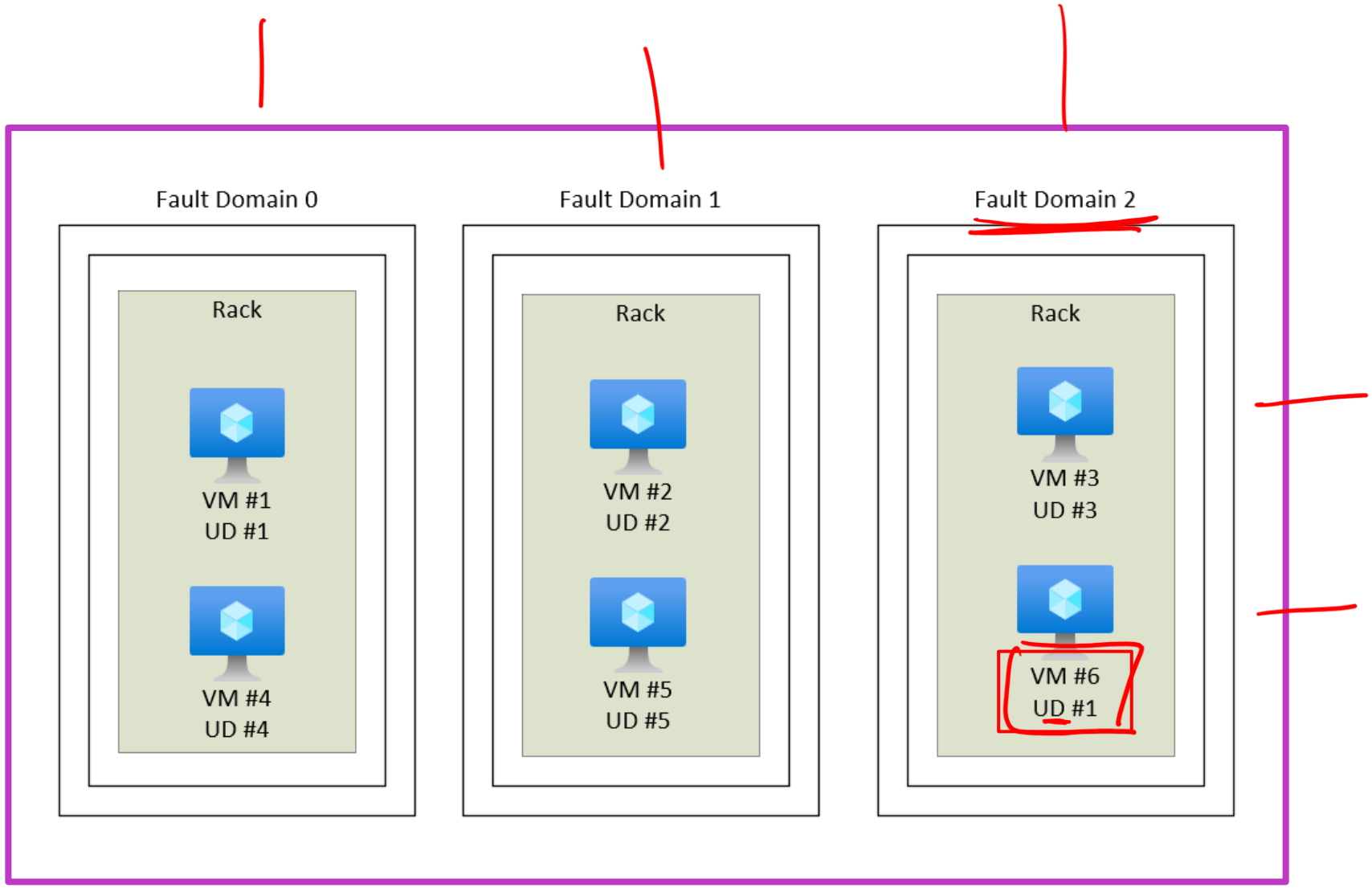
Availability Sets

Azure availability sets organize VMs into logical groupings

Enables Azure to understand how application is built

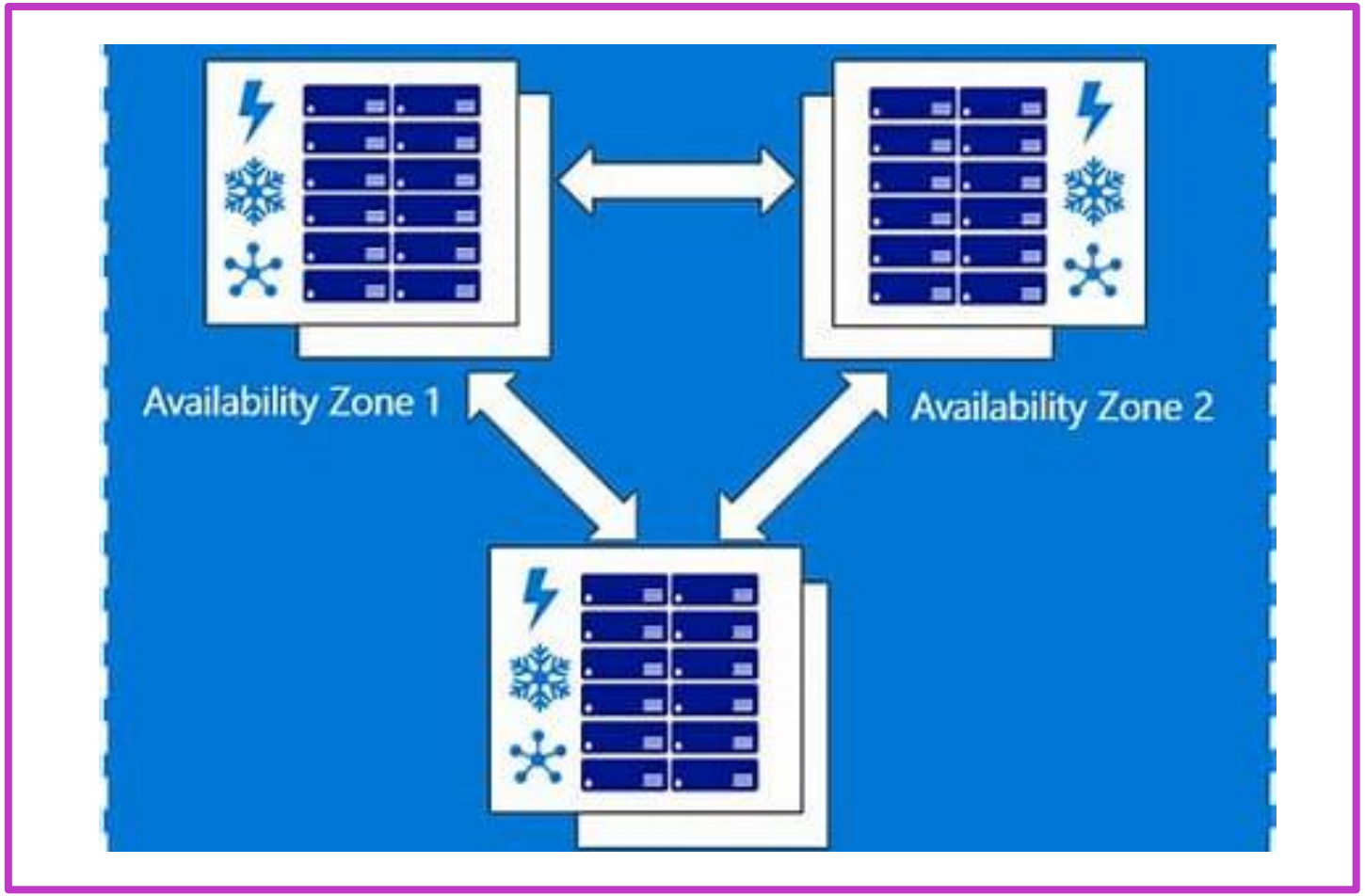
Provides better VM management, redundancy and availability

Placing two or more VMs in an availability set, assure Azure's 99.95% uptime service-level agreement (SLA)



Availability Zones

- Availability zones provide resiliency from facility-level failure
- Three availability zones per region
- Multiple instances spread over multiple availability zones
- Zonal – select a specific availability zone for service or resource
- Zonal redundant – automatically distributes resources across the three availability zones in a region



Implement Windows Server File Server high availability

- General Use FS (Active - Passive)
- Scale Out FS (Active - Active)

Explore the Windows Server File Server high-availability options

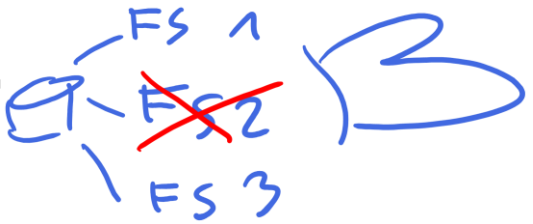
Windows File Server high availability options

- To implement resilient file services on Windows Server, you can leverage high availability inherent to Failover Clustering roles.
- Alternatively, you can provide resiliency by replicating content of volumes hosting file shares with Storage Replica.

Windows Server File Server Failover Clustering options

- **File Server for general use**. This is the traditional file server role that has been available ever since the introduction of Failover Clustering in Windows Server operating system.
- **SOFS for application data**. This clustered file server type is intended for server application data, such as Microsoft Hyper-V virtual machine files or SQL Server database files.

Implement Scale-Out File Server



Scale-Out File Servers

- Improved scaling.
- Load-balanced utilization.
- Nondisruptive maintenance, updates, and node failures.
- CSV cache.
- Automatic rebalancing of clients.
- Support for multiple SMB instances per node.
- Simplified management.

Implement SOFS for VMs

- Before you implement SOFS, you need to set up a Windows Server failover cluster, consisting of two or more nodes with the File Services role installed.
- The cluster must host share storage accessible via CSVs.
- After you create the File Server role, you need to add to it highly available shares.

Lab 03: Implementing Failover Clustering

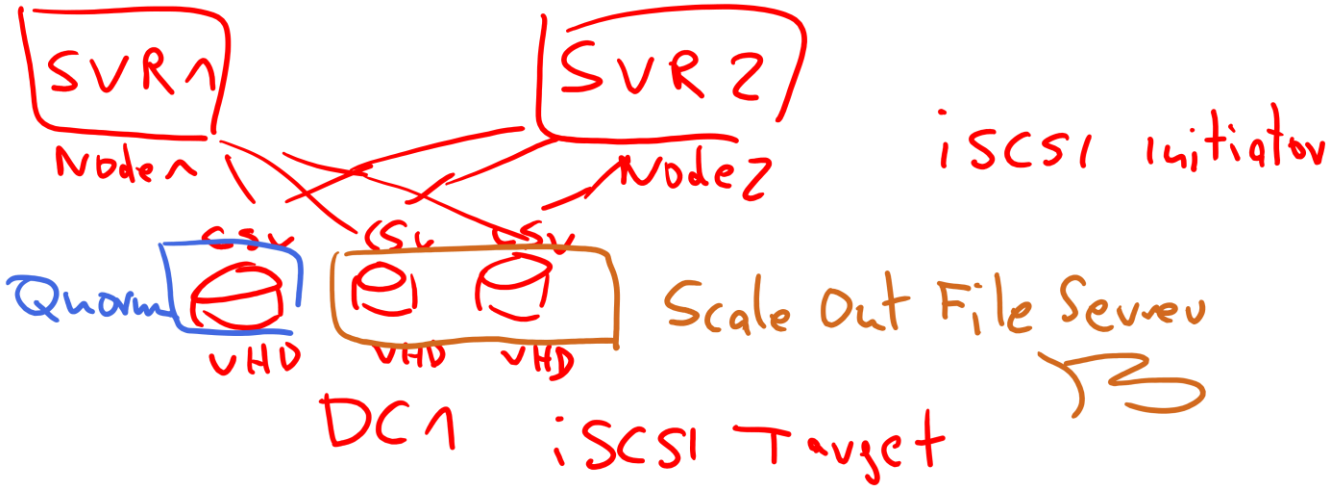
Lab 03 – Implementing Failover Clustering

Lab scenario

As one of the senior network administrators at Contoso, you're responsible for implementing failover clustering on the servers that are running Windows Server to provide high availability for network services and applications. You're also responsible for planning the failover cluster configuration and deploying applications and services on the failover cluster.

Objectives

- Configure a failover cluster
- Deploy and configure a highly available file server on the failover cluster
- Validate the deployment of the highly available file server



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