Virtual Machine Scale Set (VMSS)

Introduction to VMSS

- **What are VMSS?**
  - Azure Virtual Machine Scale Sets are a way to deploy and manage a set of identical, auto-scaling virtual machines.
- **Purpose**
  - Provides high availability and allows you to centrally manage, configure, and update a large number of VMs.

Key Features of VMSS

Auto-Scaling

- Automatically increase or decrease the number of VMs in response to demand or a defined schedule.

Integration with Load Balancers

- Automatically distribute network traffic across a group of VMs.

- **Flexible Orchestration Mode**
  - Supports both uniform (identical VM instances) and flexible (custom VM instances) orchestration modes.
- **Custom VM Images**
  - Use Azure Managed Disks or custom VM images.
- **Rolling Upgrades**
  - Deploy application updates across your scale set without downtime.

Benefits of Using VMSS

High Availability

- Ensures your application is always available, even during peak times.

Cost Efficiency

- Only pay for the compute resources you need.

Simplified Management

- Centralized control over a fleet of VMs.

Elasticity

- Respond to changes in demand seamlessly.

How VMSS Works

Instance Configuration

- Define the VM configuration including size, region, and networking.

Scaling Policies

- Configure rules for scaling in and out.

Health Monitoring

- VMs are automatically replaced if they become unhealthy.

Scaling Policies and Triggers

- **Automatic Scaling**
  - Based on metrics such as CPU utilization, memory usage, or custom metrics.
- **Scheduled Scaling**
  - Pre-defined schedules for scaling operations (e.g., scale up at 9 AM and scale down at 6 PM).
- **Manual Scaling**
  - Manually adjust the number of VMs.

Deployment Models

- **Uniform Orchestration Mode**
  - Identical VMs managed as a single unit.
- **Flexible Orchestration Mode**
  - Allows different VM sizes and configurations in the same scale set.

Lab: Setting up VMSS

Create a VMSS via Azure Portal

- Step-by-step guide on creating and configuring a VMSS.

Define Scaling Policies

- Configure auto-scaling based on performance metrics.

Resources

- https://learn.microsoft.com/en-us/azure/virtual-machine-scale-sets/overview
- https://learn.microsoft.com/en-us/azure/virtual-machine-scale-sets/virtual-machine-scale-sets-orchestration-modes

Azure Storage Services

Contents

Overview of Azure Storage

Definition: Azure Storage is a Microsoft-managed cloud service that provides storage that is highly available, secure, durable, scalable, and redundant.

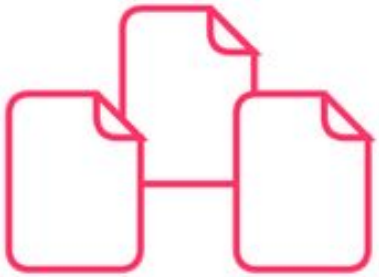
Key Features:

- Durable and highly available
- Secure
- Scalable
- Managed and accessible
- Integrated with Azure services

Data Types

Azure Storage can handle various data types, categorized as follows:

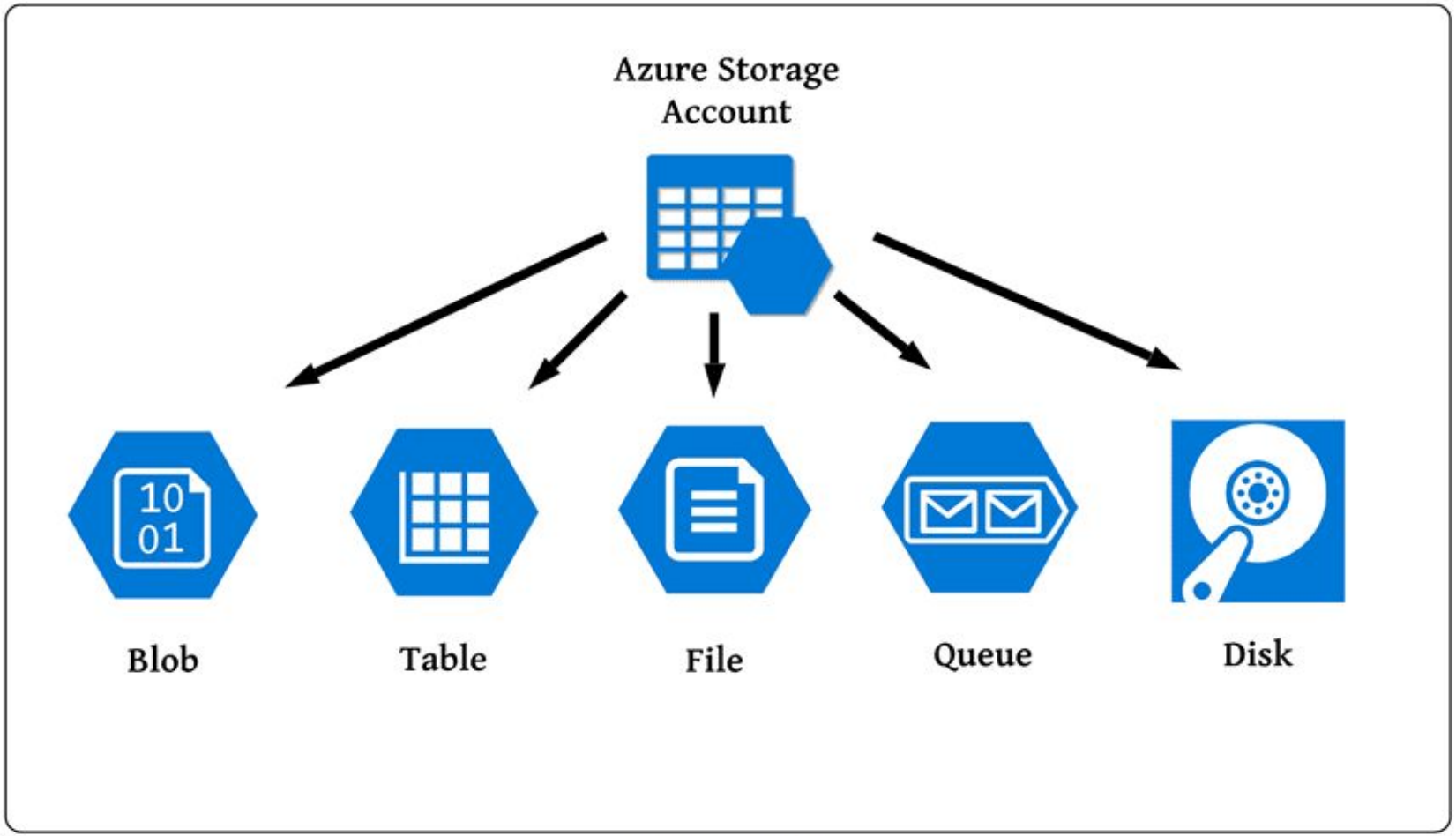
1. **Structured Data:** Highly organized and easily searchable data stored in fixed fields within a file or record. Examples are databases like SQL databases, Excel spreadsheets. Used for financial records, customer information, inventory management.
2. **Semi-Structured Data:** Data that does not conform to a rigid structure but contains tags or markers to separate data elements. Examples are JSON, YML, XML, CSV files. Used for Log files, email, social media feeds, and sensor data.
3. **Unstructured Data:** Data that lacks a predefined format or structure, making it difficult to process and analyze. Examples are text documents, videos, images, audio files. Used for multimedia content, data lakes, backup and archive data.



Unstructured	Semi-structured	Structured
PDFs, JPEGs, MP3, Movies, ...	CSV, JSON, XML, MongoDB, ...	Oracle, MSSQL, MySQL, DB2, ...

Types of Data Storage in Azure

- **Blob Storage:** Object storage for the cloud
- **File Storage:** Fully managed file shares in the cloud
- **Queue Storage:** Messaging service for communication between applications
- **Table Storage:** NoSQL key-value store for rapid development
- **Disk Storage:** High-performance, durable block storage for Azure VMs



Source: www.partech.nl

Redundancy Options (Replication)

Azure provides multiple redundancy options to ensure data availability and durability:

A. Locally Redundant Storage (LRS)

- **Definition**: Replicates data three times within a single data center in a region.
- **Use Case**: Suitable for scenarios where data can be easily recreated, or when data loss is acceptable within the same region.

B. Zone-Redundant Storage (ZRS)

- **Definition**: Replicates data across three Azure availability zones within a region.
- **Use Case**: Ideal for scenarios requiring higher availability and protection from data center failures.

C. Geo-Redundant Storage (GRS)

- **Definition**: Replicates data to a secondary region hundreds of miles away from the primary region.
- **Use Case**: Suitable for disaster recovery scenarios where data needs to be available even in the event of a regional outage.

D. Read-Access Geo-Redundant Storage (RA-GRS)

- **Definition**: Similar to GRS but provides read access to the data in the secondary region.
- **Use Case**: Ideal for applications needing read access to data from the secondary region, enhancing data availability during outages.

E. Geo-Zone-Redundant Storage (GZRS)

- **Definition**: Combines the benefits of ZRS and GRS, replicating data across zones within a region and to a secondary region.
- **Use Case**: Best for critical applications requiring high availability, data durability, and disaster recovery.

Storage Tiers

Azure Storage offers different tiers to balance between cost and access requirements.

- **Hot Tier:** Optimized for data that is accessed frequently. Used for active datasets, user content, operational analytics.
- **Cool Tier:** Lower cost for infrequently accessed data. Used for backup data, long-term data storage with infrequent access.
- **Archive Tier:** Lowest cost for rarely accessed data, with higher retrieval latency. Used for archival storage, compliance and legal data

Blob Storage

Blob storage is optimized for storing massive amounts of unstructured data, such as text or binary data.

Types of Blobs:

- Block blobs: Efficiently upload large blobs
- Append blobs: Optimized for append operations
- Page blobs: Random read/write storage, used for VHDs

Blob Storage

Common Use Cases:

- Serving images or documents directly to a browser
- Storing files for distributed access
- Streaming video and audio

Integration with Storage Tiers: Blobs can be stored in hot, cool, or archive tiers depending on access patterns.

File Storage

Azure Files offers fully managed file shares in the cloud that are accessible via the industry standard Server Message Block (SMB) protocol, Network File System (NFS) protocol, and Azure Files REST API.

Key Features:

- Shared access
- Managed and scalable
- Integration with on-premises

Common Use Cases:

- File shares for lift and shift applications
- Shared storage for applications using SMB
- Replacing or supplementing on-premises file servers

Queue Storage

Queue storage provides reliable messaging for workflow processing and communication between applications and services.

Key Features:

- Asynchronous messaging
- Decoupling of components
- Load leveling

Common Use Cases:

- Building flexible and scalable applications
- Decoupling application components
- Load balancing and task distribution

Table Storage

Azure Table Storage is a NoSQL key-value store for rapid development using a schema-less design.

Key Features:

- High availability
- Cost-effective
- Fast access to large amounts of data

Common Use Cases:

- Storing structured, non-relational data
- Web applications
- Storing user data for web applications

Disk Storage

Disk Storage provides persistent, secured disk options for virtual machines.

Key Features:

- High performance
- Durability and availability
- Scalable sizes

Common Use Cases:

- High-performance workloads
- Databases
- Enterprise applications

Azure Backup

Azure Backup is a service that helps protect data by backing it up to the Microsoft Azure cloud.

Key Features:

- Simple and reliable
- Secure
- Cost-effective
- Integrated with Azure services

Common Use Cases:

- Backup of Azure VMs
- On-premises backup
- Application backup

Get Certified: Microsoft Applied Skills

Storage Applied Skill - https://learn.microsoft.com/en-us/credentials/applied-skills/secure-storage-azure-files-azure-blob-storage/

Guided Project - https://learn.microsoft.com/en-us/training/modules/guided-project-azure-files-azure-blobs/

Assignment

1. Write a blog on Creating and Configuring a Virtual Machine Scale Set
2. Attempt Storage Applied Skill Assessment - https://learn.microsoft.com/en-us/credentials/applied-skills/secure-storage-azure-files-azure-blob-storage/

Submission Deadline:

1. VMSS blog - Friday
2. Storage Applied Skill - Saturday

Submission Link:

1. https://forms.gle/Z8XsGfjqqPty9DPEA
2. Share screenshots of your attempt on Storage Applied Skills in the group.