CLOUD COMPUTING
UNIT-4

Microsoft Azure Fundamentals

UNIT –IV

Microsoft Azure Fundamentals: Azure Regions and Data Centers, Understanding of Microsoft Azure portal, Introduction to all Azure services, Virtual Machine instances, Azure VM.

Microsoft Azure Storage: Overview of Microsoft Azure Storage, Storage Services Blob, Table, queue, File, Managed and Unmanaged Disk.

Azure Regions and Data Centers

Azure Regions

- Geographic areas containing one or more data centers networked together with **low-latency** connections

- Regions allow customers to deploy applications and data close to their users to ensure **low latency** and **high availability**.

- Azure has 60+ regions across North America, Europe, Asia Pacific, and more. Each region is designed to offer high availability and redundancy.

Availability Zones:

Within a region, Azure offers availability zones. These are physically separate data centers connected by a high-speed network.

By deploying your resources across multiple availability zones within a region, you gain redundancy. If one zone experiences an outage, your resources in another zone remain operational, minimizing downtime and ensuring business continuity.

In essence, regions provide broader geographic distribution, while availability zones offer redundancy within a specific region. This two-tiered approach lets you optimize your cloud infrastructure for performance, reliability, and disaster recovery.

Azure Regions

Norway West
Norway East
West Europe
UK South
Germany North (Public)
Germany Northeast (Sovereign)
North Europe
Poland Central
UK West
Austria East
France Central
Germany Central (Sovereign)
France South
Germany West Central (Public)
Spain Central
Italy North
Switzerland West
Greece
Switzerland North
Israel Central
Qatar Central
UAE North
UAE Central

Canada East
West US 2
Canada Central
Central US
West Central US
North Central US
West US
US DoD Central
US DoD East
US Gov Arizona
US Gov Texas
West US 3
South Central US
East US
East US 2
US Gov Virginia
Mexico Central

China North
China North 2
Korea Central
Japan East
Korea South
Japan West
China East 2
China East
East Asia
Taiwan
West India
Central India
South India
Southeast Asia

Brazil Southeast
Brazil South
South Africa North
South Africa West

Australia East
New Zealand North
Australia Central
Australia Southeast
Australia Central 2

- Available region
- Announced region
- Availability Zones available
- Announced Availability Zones
- Announced region with Availability Zones

Choosing a Region

1. **Latency & Performance**

   - Choose a region **closest to your users** to reduce network latency.

   - We can use Tools https://azurespeedtest.azurewebsites.net/ to compare latency.

2. **Service Availability**

   - Not all services are available in every region. Ensure that the services you need are available in the region you are considering.

   - Some regions may have newer features or updates before others. Check if the region has the latest features you require.

   - https://azure.microsoft.com/en-in/explore/global-infrastructure/products-by-region/table

3. Compliance & Data Residency

- Some industries and governments require data to stay within a specific country or region.

4. Pricing & Cost Optimization

- Azure prices **vary by region** due to demand, electricity costs, and infrastructure.

- We can use the Azure pricing calculator to compare costs.

(https://azure.microsoft.com/en-us/pricing/calculator/)

Azure Data Center

An **Azure Data Center** is a physical facility that houses **servers, networking hardware, and storage** used to run Microsoft Azure cloud services. These data centers are distributed worldwide to provide **scalability, redundancy, and reliability** for cloud applications.

Understanding of Microsoft Azure portal
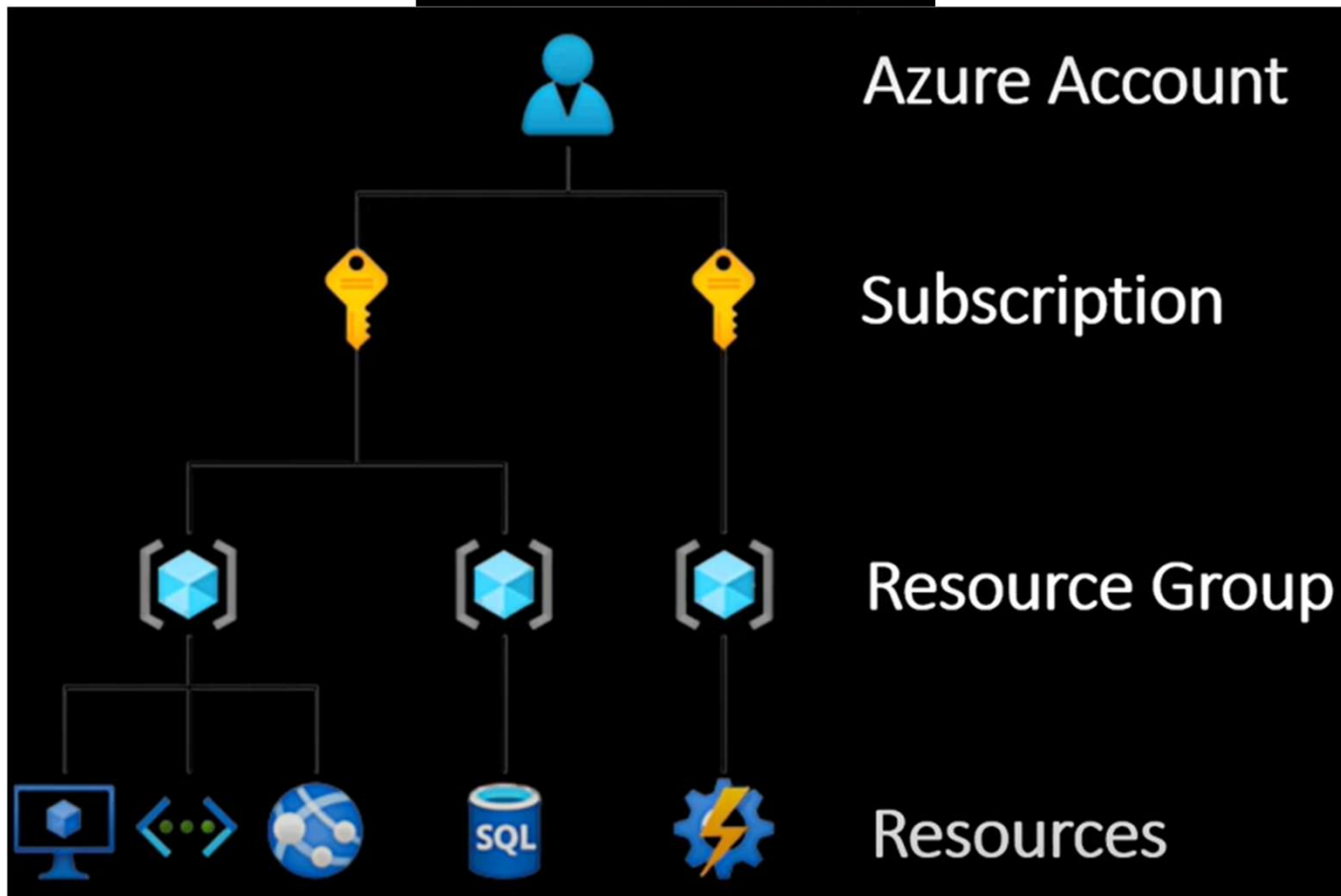
Understanding of Microsoft Azure portal

The Azure portal is a **web-based, unified console** that lets you create and manage all your Azure resources. With the Azure portal, you can manage your Azure subscription using a graphical user interface. You can **build, manage, and monitor everything** from simple web apps to complex cloud deployments **in the portal.**

The different parts of the Azure portal are:

- Home

- Portal elements and controls

- Portal menu

- Service menu

- Dashboard

Understanding of Microsoft Azure portal

Home

By default, the first thing you see after you [sign in to the portal](#) is **Home**. This page compiles resources that help you get the most from your Azure subscription. Select **Create a resource** to quickly create a new resource in the current subscription, or choose a service to start working in.
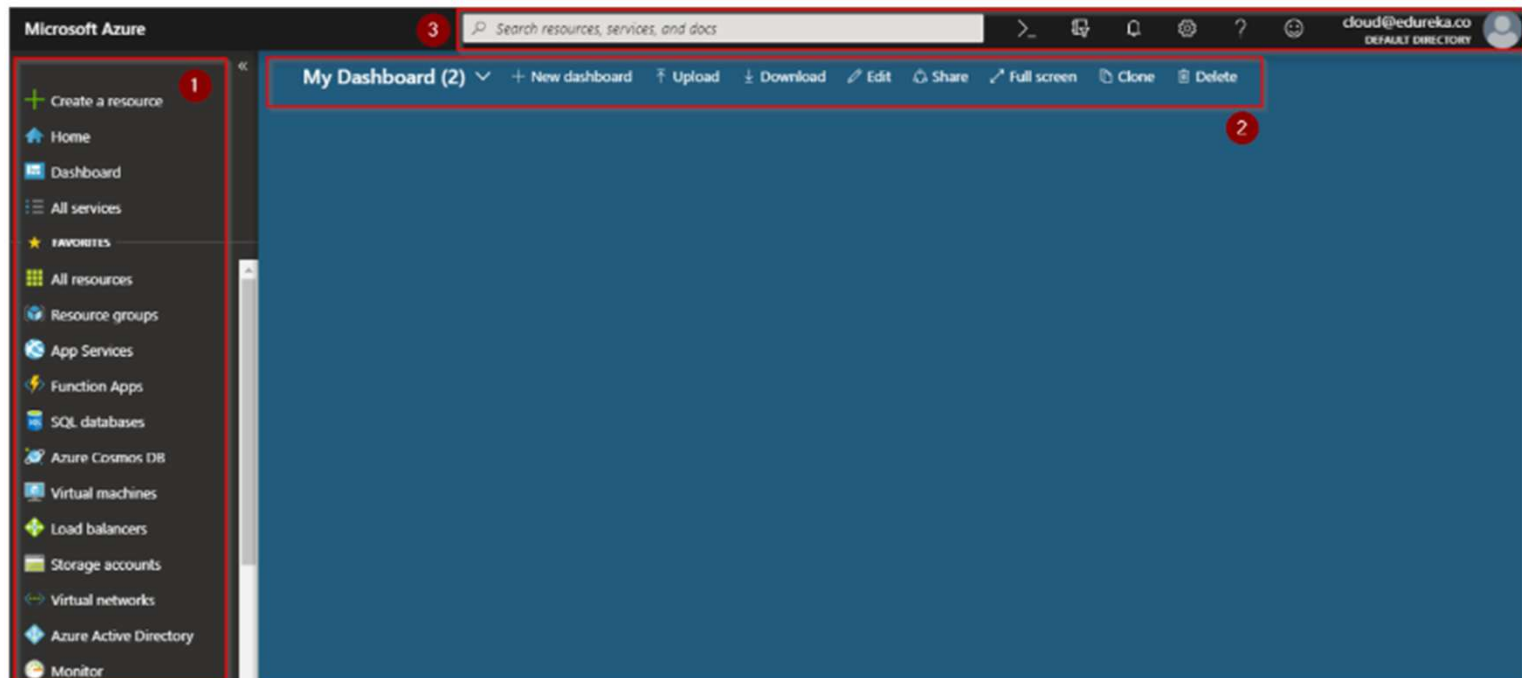
In the image above, **1** the left portion gives you **one-click access** to all the service domains.

2 Next to it, in blue, is the **dashboard**, which is empty by default. If any applications are up and running, they can be pinned to it.

3 On top of it is the search bar, where you can **search for services and resources** that don't feature on the screen.

Understanding of Microsoft Azure portal

Portal element and controls

> **Portal menu and**
> **Page header**

are **global elements** that are always present in the Azure portal. These persistent features are the "shell" for the user interface associated with each individual service or feature.
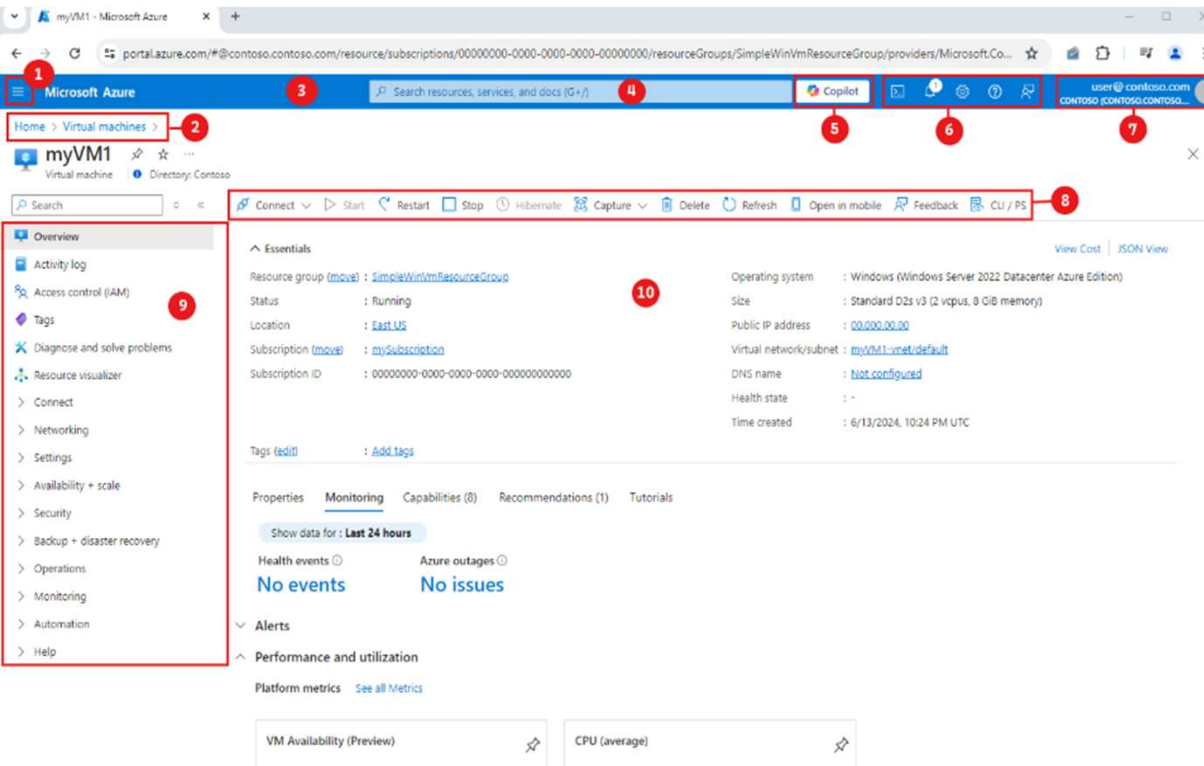
The header provides access to global controls.

The working pane for a resource or service may also have a <u>service menu</u> with commands specific to that area.

Understanding of Microsoft Azure portal

Portal element and controls

For Example, virtual machine (VM),

Key	Description
1	**Portal menu**. This global element can help you to navigate between services. Here, the portal menu is in flyout mode, so it's hidden until you select the menu icon.
2	**Breadcrumb**. Use the breadcrumb links to move back a level in your workflow.
3	**Page header**. Appears at the top of every portal page and holds global elements.
4	**Global search**. Use the search bar in the page header to quickly find a specific resource, a service, or documentation.
5	**Copilot**. Provides quick access to Microsoft Copilot in Azure (preview).
6	**Global controls**. These controls for common tasks persist in the page header: Cloud Shell, Notifications, Settings, Support + Troubleshooting, and Feedback.
7	**Your account**. View information about your account, switch directories, sign out, or sign in with a different account.
8	**Command bar**. A group of controls that are contextual to your current focus.
9	**Service menu**. A menu with commands that are contextual to the service or resource that you're working with. Sometimes referred to as the resource menu.
10	**Working pane**. Displays details about the resource or service that's currently in focus.

Understanding of Microsoft Azure portal

Portal menu

The Azure portal menu lets you quickly get to key functionality and resource types. It's available from anywhere in the Azure portal.
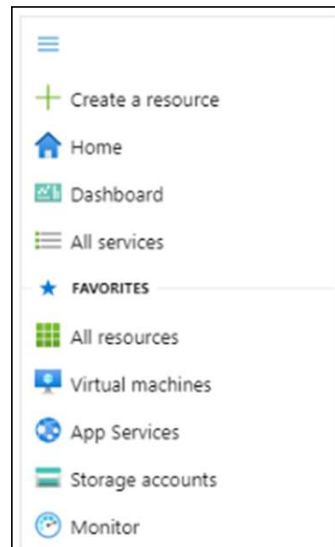

Useful commands in the portal menu include:

➢ **Create a resource**. An easy way to get started creating a new resource in the current subscription.
➢ **Favorites**. Your list of favorite Azure services.
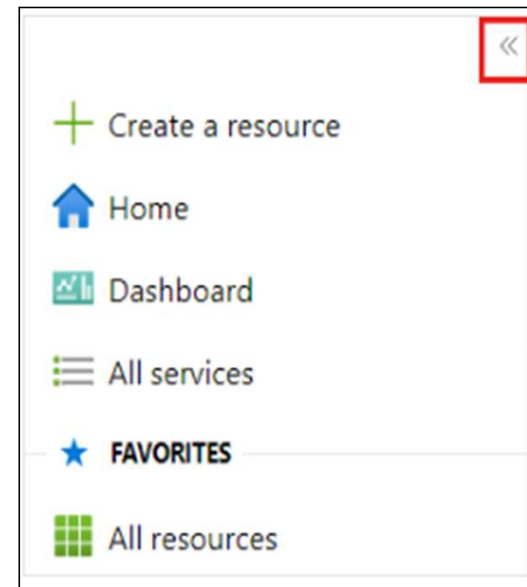
Understanding of Microsoft Azure portal

Portal menu

In your portal settings, you can [choose a default mode for the portal menu](#): flyout or docked.

When the portal menu is in **flyout mode**, it's **hidden** until you need it. Select the **menu icon** to open or close the menu.
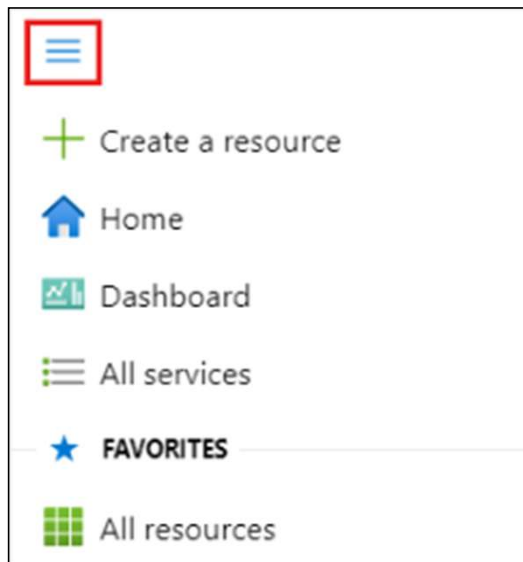
If you choose **docked mode** for the portal menu, it's **always visible**. You can select the arrows to manually collapse the menu if you want more working space.
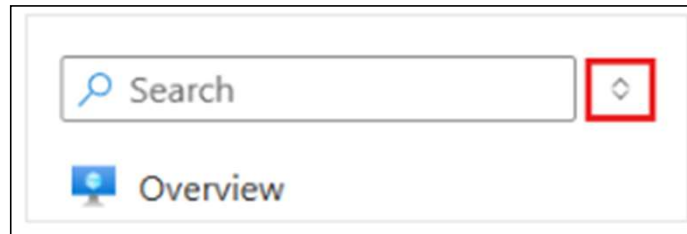
Understanding of Microsoft Azure portal

Service menu

The service menu appears when you're **working with an Azure service or resource**. Commands in this menu are contextual to the service or resource that you're working with. You can use the search box at the top of the service menu to quickly find commands.

By default, menu items appear collapsed within menu groups. If you prefer to have all menu items expanded by default, you can set **Service menu behavior** to **Expanded** in your [portal settings](portal%20settings).

When you're working within a service, you can select any top-level menu item to expand it and see the available commands within that menu group. Select that top-level item again to collapse that menu group.
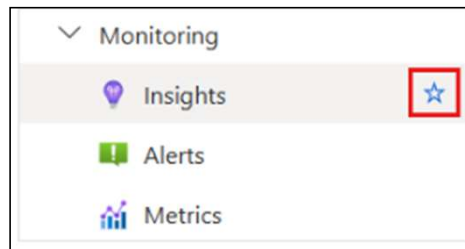
To toggle all folders in a service menu between collapsed and expanded, select the **expand/collapse icon** near the service icon search box.
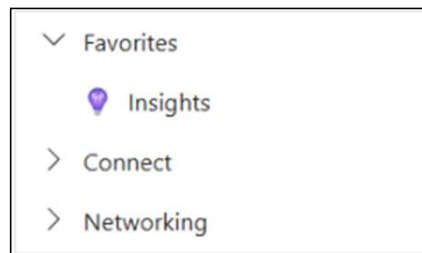
Understanding of Microsoft Azure portal

Service menu

If you use certain service menu commands frequently, you may want to save them as favorites for that service. To do so, hover over the command and then select the **star icon**.

When you save a command as a favorite, it appears in a **Favorites** folder near the top of the service menu.
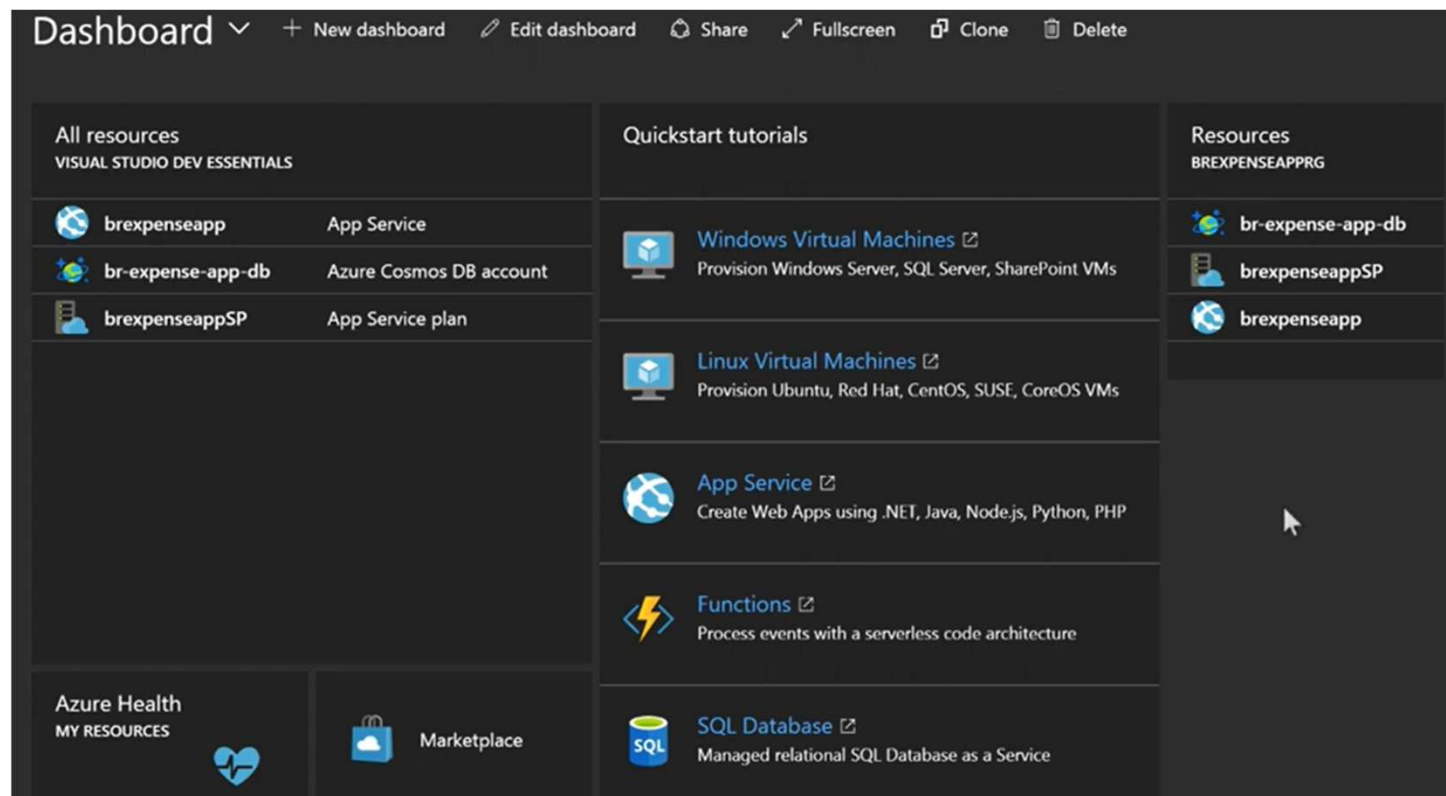
Understanding of Microsoft Azure portal

Dashboard

Dashboards provide a focused view of the resources in your subscription that matter most to you. We give you a **default dashboard** to get you started. You can **customize this dashboard to bring resources you use frequently into a single view**, or to display other information.

Introduction to all Azure services

It provides a wide range of cloud services, including **computing power (virtual machines), storage solutions, databases, networking, analytics, artificial intelligence (AI), machine learning (ML), Internet of Things (IoT), and more**.

Users or organizations can choose and scale these services to develop, deploy, and manage applications globally through Microsoft-managed data centers.

Azure offers different types of cloud services that are tailored to cater to the diverse needs of numerous industries. Currently, Azure **provides more than 200 cloud services**,

Introduction to all Azure services

1. Compute Services

These services provide the computing power needed to run applications and workloads.

➤ **Azure Virtual Machines (VMs)**: On-demand, scalable virtual machines for running Windows or Linux workloads.

➤ **Azure App Service**: Platform for building, deploying, and scaling web apps, mobile app backends, and RESTful APIs.

➤ **Azure Batch**: Service for running large-scale parallel and high-performance computing (HPC) applications.

Introduction to all Azure services

2. Storage Services

      Azure Storage ensures data durability, high availability, and secure access. Azure Storage Services offers a variety of storage solutions to meet different data needs. These include:

- **Blob Storage**: Store unstructured data such as documents, images, and videos.
- **File Storage**: Managed file shares that can be accessed via SMB protocol.
- **Queue Storage**: Store and retrieve messages for asynchronous processing.
- **Table Storage**: NoSQL key-value store for semi-structured data.
- **Disk Storage**: Persistent, managed disks for Azure VMs, available in various performance tiers.
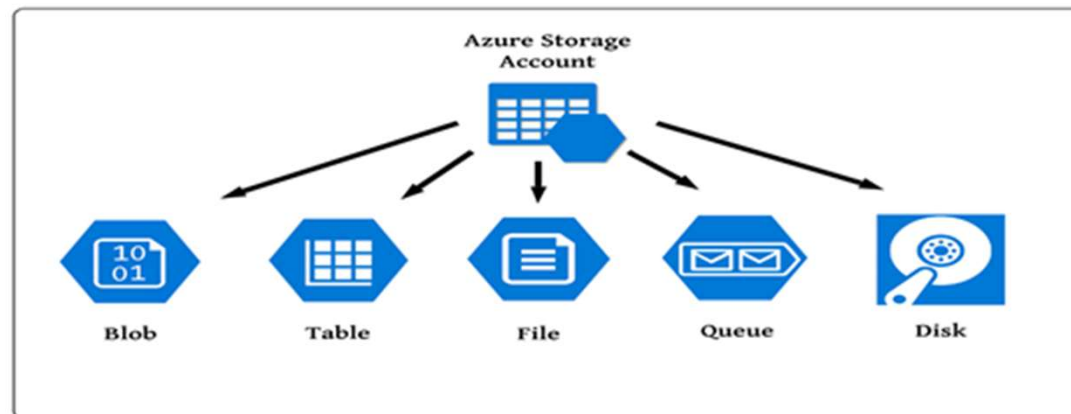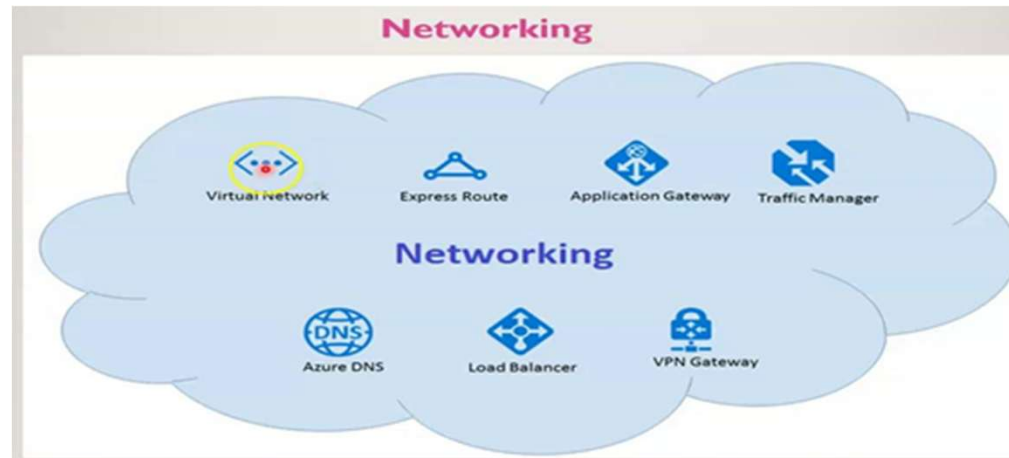
Introduction to all Azure services

3. Networking

Azure Networking Services enable you to build and manage network infrastructure in the cloud. These services ensure reliable, secure, and efficient connectivity. Key components include:

- **Virtual Network (VNet):** Create isolated networks within the Azure cloud.
- **Azure Load Balancer:** Distribute incoming network traffic across multiple VMs for high availability.
- **Azure VPN Gateway:** Establish secure connections between on-premises networks and Azure.
- **Azure DNS:** Host your DNS domains and manage your DNS records.
- **Azure Content Delivery Network (CDN):** Deliver high-bandwidth content to users around the world.

Introduction to all Azure services

4. Data Analysis

Azure Data Analysis Services provide tools for analyzing and processing large datasets. These services help you gain insights and make data-driven decisions.

- **Azure Synapse Analytics:** Unified analytics service that integrates big data and data warehousing.
- **Azure Data Lake Storage:** Scalable and secure data lake for high-performance analytics.
- **Azure Databricks:** Apache Spark-based analytics platform for big data and AI.
- **Azure HDInsight:** Fully managed, full-spectrum, open-source analytics service for enterprises.

5. Artificial Intelligence (AI)

Azure AI Services enable you to build intelligent applications. These services simplify the integration of AI capabilities into your applications.

- **Azure Cognitive Services:** Pre-built APIs for vision, speech, language, and decision-making tasks.
- **Azure Bot Service:** Develop and deploy intelligent bots for various channels.
- **Azure Machine Learning:** End-to-end service for building, training, and deploying machine learning models.

Introduction to all Azure services

6. Machine Learning (ML)

Azure Machine Learning (ML) provides a platform for building and deploying predictive models, accelerating the development of intelligent applications.

- **Automated ML:** Automatically build and tune machine learning models.
- **Azure ML Studio:** Drag-and-drop interface for building and training models.
- **Model Management:** Track and manage models throughout their lifecycle.
- **Integration:** Seamlessly integrate with other Azure services and on-premises data sources.

7. Internet of Things (IoT)

Azure IoT Services enable you to connect, monitor, and manage IoT devices. These services help you harness the power of IoT for real-time data and insights

.

- **Azure IoT Hub:** Central message hub for bi-directional communication between IoT applications and devices.
- **Azure IoT Central:** Fully managed IoT app platform for building IoT solutions.
- **Azure Sphere:** Secure, end-to-end IoT solution.
- **Azure Digital Twins:** Create comprehensive digital models of physical environments.

Introduction to all Azure services

8. Azure DevOps

      Azure DevOps Services support continuous integration and continuous delivery (CI/CD), ensuring faster, more reliable software delivery.

- Azure Pipelines: Automate builds and deployments.
- Azure Repos: Source code management with Git repositories.
- Azure Test Plans: Automated and manual testing tools.
- Azure Artifacts: Package management for dependencies

9. Security and Identity

      Azure Security and Identity Services protect your data and manage access. These services enhance security and ensure compliance.

- Azure Active Directory (AAD): Identity and access management service.
- Azure Key Vault: Securely store and manage sensitive information such as keys, secrets, and certificates.
- Azure Security Center: Unified security management and threat protection.
- Azure Sentinel: Cloud-native security information and event management (SIEM) solution.

Introduction to all Azure services

10. Database Services

      Azure Database Services offers managed databases for various data types. These services provide scalability, high availability, and built-in security for your data.

- **Azure SQL Database**: Fully managed relational database service.
- **Azure Cosmos DB**: Globally distributed, multi-model database service.
- **Azure Database for PostgreSQL**: Fully managed PostgreSQL database.
- **Azure Database for MySQL**: Fully managed MySQL database.
- **Azure Database for MariaDB**: Fully managed MariaDB database.

Virtual Machine Instances

In Microsoft Azure, **Virtual Machine (VM) Instances** are scalable, on-demand computing resources that allow you to run a wide range of workloads, from small applications to large-scale enterprise systems. Azure VMs provide flexibility by supporting various operating systems, configurations, and pricing models

1.Flexibility:

1. Supports **Windows** and **Linux** operating systems.
2. Choose from a wide range of VM sizes and configurations to match your workload requirements. VMs come in different sizes optimized for different workloads. select CPU, RAM, and storage resources based on needs.

2.Scalability:

1. Scale up (increase VM size) or scale out (add more VMs) based on demand.
2. Use **Azure Virtual Machine Scale Sets** to automatically scale VMs.

3. Pricing Options:

1. **Pay-as-you-go**: Pay for what you use with no upfront costs.
2. **Reserved Instances**: Save costs by committing to 1 or 3 years of usage.
3. **Spot Instances**: Use unused Azure capacity at a significantly reduced cost (ideal for fault-tolerant workloads).

Virtual Machine Instances

4. High Availability:

1. Deploy VMs across **Availability Zones** for fault tolerance.
2. Use **Availability Sets** to distribute VMs across multiple physical servers within a data center.

5. Integration:

1. Seamlessly integrate with other Azure services like **Azure Storage**, **Azure Networking**, and **Azure Backup**.
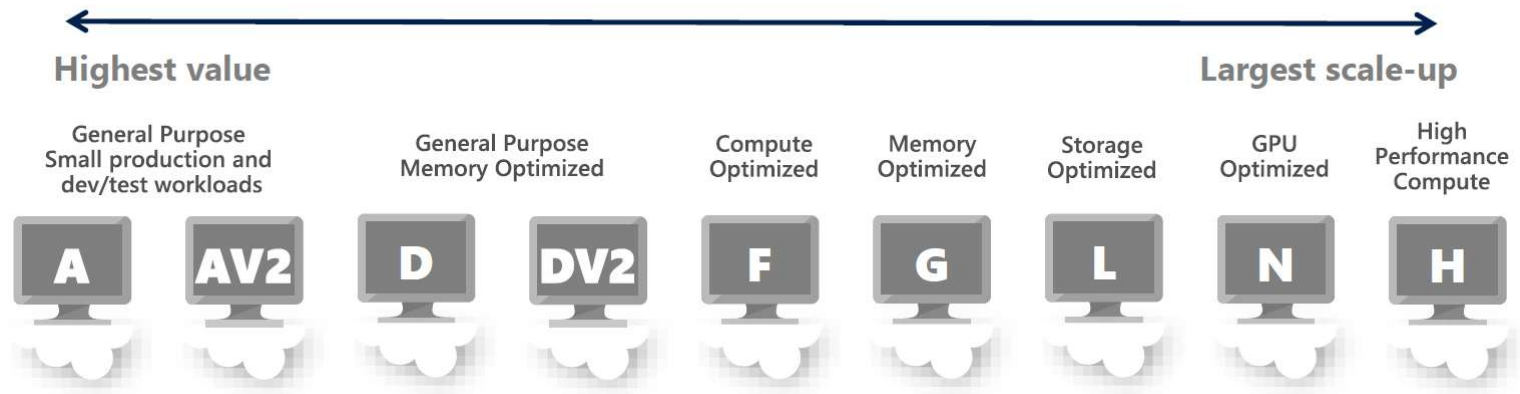
6. Security:

1. Built-in security features like **Azure Security Center** and **Azure Disk Encryption**.
2. Support for **private networks** and **firewalls**.

Azure Virtual Machine

Types Of VMs In Azure

Azure offers a variety of VM series optimized for different
workloads:
1.General Purpose VMs.
2.Compute Optimized VMs.
3.Memory Optimized VMs.
4.Storage Optimized VMs.
5.GPU Optimized VMs.
6.High Performance VMs.

Highest value   Largest scale-up

| General Purpose Small production and dev/test workloads | | General Purpose Memory Optimized | Compute Optimized | Memory Optimized | Storage Optimized | GPU Optimized | High Performance Compute |

A   AV2   D   DV2   F   G   L   N   H

1.General-purpose VMs(D-series):

The D-series Azure VMs offer a combination of vCPUs, memory and temporary
storage that are able to meet the requirements associated with most
production workloads.

- Provide a balanced ratio of CPU-to-memory.
- These VMs are suitable for testing and development environments, small to medium

Databases, and low to medium traffic webservers.

VMs Sizes: Av2,DCv2 etc..

Example Applications: many enterprise-grade applications, e-commerce systems,
web front ends, desktop virtualisation solutions, customer relationship
management applications, entry-level and mid-range databases,
application servers, gaming servers, media servers.

2.Compute-optimized VMs(F-series):

F-series VMs feature a higher CPU-to-memory ratio. They are equipped with 2 GB RAM
and 16 GB of local solid state drive (SSD) per CPU core and are optimized
for compute intensive workloads.
These VMs are suitable for batch processing, application servers, medium traffic
Webservers, and networks applications.

VMs Sizes: Fsv2

Example Applications: batch processing, web servers, analytics and gaming.

3.Memory-optimized VMs(E-series):

The E-series Azure VMs are optimized for heavy in-memory applications such as
 SAP HANA. These VMs are configured with high memory-to-core ratios, which makes
 them well-suited for memory-intensive enterprise applications, large relational
database servers, in-memory analytics workloads etc.
VMs Sizes: Dv2,Dsv2,ev3,etc..
Example Applications: SAP HANA (e.g., E64s v3, E20ds v4, E32ds v4, E48ds v4, E64ds v4), SAP S/4 HANA application layer, SAP NetWeaver application layer, and more broadly memory-intensive enterprise applications, large relational database servers, data warehousing workloads, business intelligence applications, in-memory analytics workloads, and additional business-critical applications, including systems that process transactions of a financial nature.

4.Storage-optimized VMs(G-series):

G-series VMs feature the Intel Xeon processor E5 v3 family, two times more memory and four times more Solid State Drive storage (SSDs) than the General Purpose D-series. G-series features up to ½ TB of RAM and 32 CPU cores and provide unparalleled computational performance, memory and local SSD storage for your most demanding applications.
Provide IO and High disk throughput.
These VMs are suitable for transactional, SQL or NoSQL dtabases,data Warehousing, and bigdata.
VMs Sizes: Lsv2.
Example Applications: large SQL and NoSQL databases, ERP, SAP and data warehousing solutions.

5.GPU-accelerated VMs(N-series):

- The N-series is a family of Azure Virtual Machines with GPU capabilities.
- GPUs are ideal for compute and graphics-intensive workloads, helping customers to fuel innovation through scenarios like high-end remote visualization, deep learning, and predictive analytics.
- Provide GPU based processing.
- These VMs are meant for a model training and inference.
- Deep learning, heavy graphics rendering or video editing.

VMs Sizes: NC,NCv2,etc.

Example Applications: simulation, deep learning, graphics rendering, video editing, gaming and remote visualization.

6.High-performance compute (HPC) VMsP(H-series):

- The HB-series VMs are optimized for HPC applications, such as financial analysis, weather simulation, and silicon RTL modeling.
- These instances provide premium CPU support and resources and high-throughput network interfaces, Such as RDMA.
- These VMs were meant for high compute ,mission-critical workloads.

VMs Sizes: H,HB,HBv2 and HC.

Example Applications: fluid dynamics, finite element analysis, seismic processing, reservoir simulation, risk analysis, electronic design automation, rendering, Spark, weather modeling, quantum simulation, computational chemistry, heat transfer simulation.

Steps to Create Azure VM

1. **Go to Azure Portal** → Azure Portal

2. **Navigate to "Virtual Machines"** → Click on "Create" → "Azure Virtual Machine"

3. **Configure Basics** → Select Subscription, Resource Group, VM Name, Region, and Image (OS)

4. **Choose VM Size** → Pick based on CPU, RAM, and workload needs

5. **Set Authentication** → Use SSH key (Linux) or password (Windows)

6. **Configure Disks & Networking** → Choose SSD/HDD and set inbound/outbound rules

7. **Review & Create** → Click "Review + Create" and then "Create"

Overview of Microsoft Azure Storage

The Azure Storage platform is Microsoft's cloud storage solution for modern data storage scenarios. Azure Storage offers **highly available, massively scalable, durable, and secure storage for a variety of data objects in the cloud.** Azure Storage data objects are accessible from anywhere in the world over HTTP or HTTPS via a REST API. Azure Storage is:

➢ **Highly available and durable.** Azure storage ensures that customers data is safe and available in the events of hardware failures or even natural disasters. Azure provides an option for data replication across datacenters or geographical regions for added protection. Data, therefore, still remains highly available.

➢ **Secure.** Azure storage provides high security by data encryption and also provides fine-grained control over who has access to your data.

➢ **Scalable.** Azure Storage is designed such as to provide high scalability and performance requirements of the application.

Azure Storage Features

High availability and durability
Data replication across data centers, zones and regions

Security
Encryption and fine grained access control services of your data

Scalability
High performance and scalability for high performant applications

Overview of Microsoft Azure Storage

Azure provides facilities to **replicate the copies** of the storage account as per the redundancy opted during its creation.

There are **four different replication** options.

- **LRS (Locally Redundant Storage)** – It is a low-cost replication strategy, and the data is replicated within the same data center

- **ZRS (Zone Redundant Storage)** – Data is replicated synchronously across three availability zones in the same regions for high availability and durability

- **GRS (Geo Redundant Storage)** – In GRS the data replication happens across different regions. Data cannot be accessed in GRS

- **RA-GRS (Read Access Geo Redundant Storage)** – This is similar to GRS as the data is replicated across regions, but with the read access.

Microsoft Azure Storage Types

One of the most important steps in choosing Microsoft Azure storage type is defining **what** you want to store, **how** and **which** options and features you need to achieve that.

There are **five storage types** available in Microsoft Azure divided into two groups.
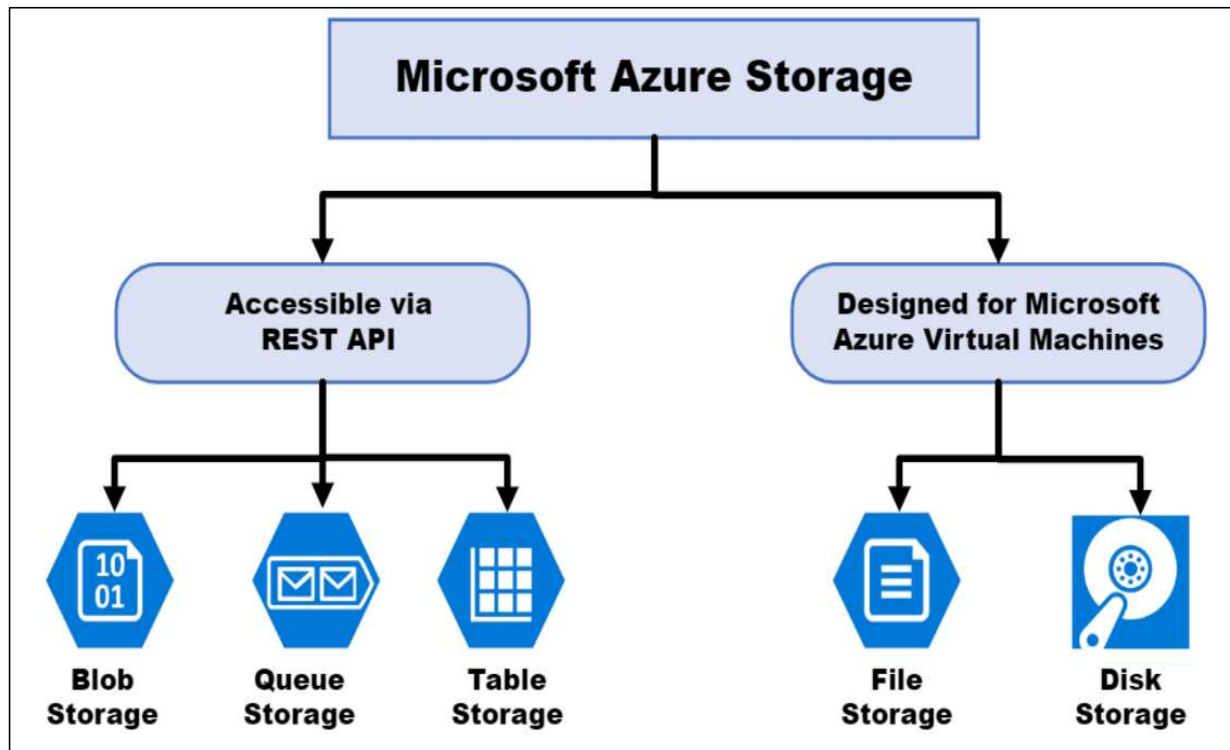

- **Blob Storage**: Stores text and binary data.

- **Azure Queues**: Messaging store for messaging between application components.

- **Azure Tables**: Storage of structured data.

- **File Storage**: Provide shared storage using SMB and NFS protocols.

- **Disk Storage:** Provide a virtual hard disk that can be attached to virtual machines.

Microsoft Azure Storage Types

1. Azure Blob Storage

Generally, the word **"Blob"** originates from databases, where you can **store a huge binary object (file) in a database**. **Microsoft Azure Blob Storage** is design to store large unstructured amounts of data along with their meta-data. Thus, files can be store, at very low cost, in containers (folders). Where you can store any number of Blob files up to 500 TB in size. Each Blob has a size of 2GB. You may also use Blob storage for data backup.

Blob Storage Resources
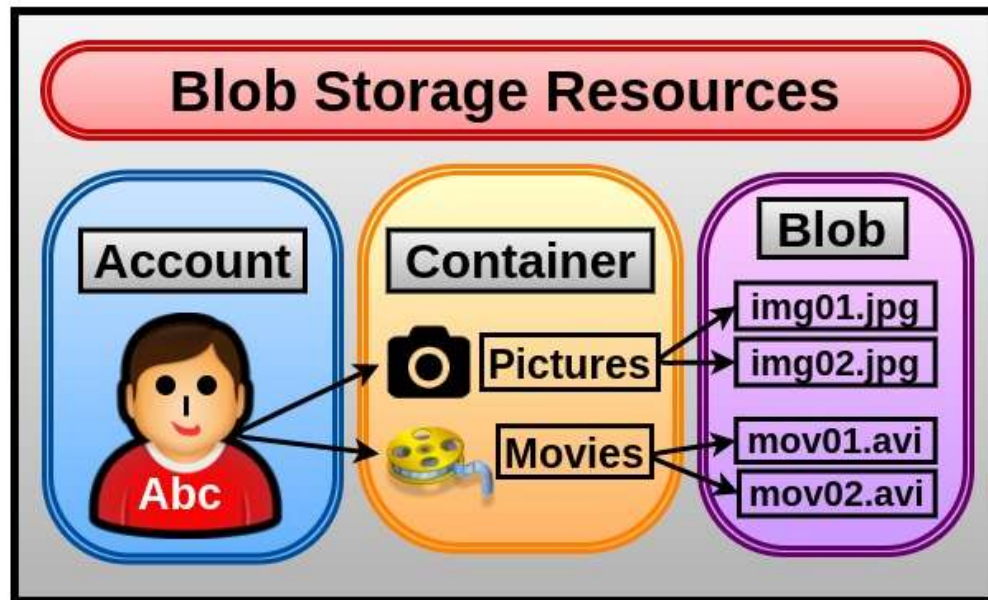
Microsoft Azure Storage Types

Storage Account : Under this account, each object you store has an address that contains your unique account name. And it also forms the object's base address by combining account name and azure storage blob endpoints in your storage account.

In addition, it also provides **three types of tiers** which are selected, at the creation's time of storage account :
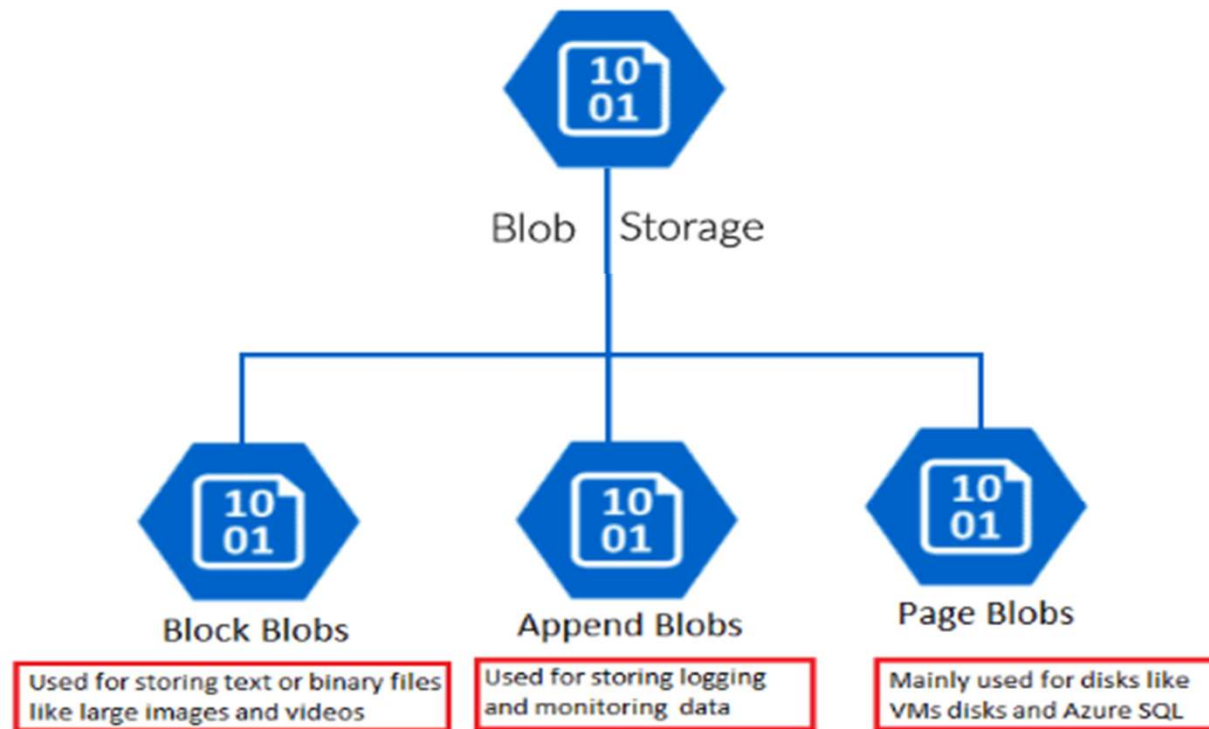
- **Hot Access Tier :** The Hot access tier is the most optimized for the frequently accessed data. It also provides the lower cost of access (read-write), but the higher cost of storage.

- **Cool Access Tier :** This alternative is ideally suited for cases where data is stored for at least 30 days, and for infrequently access data. This tier also provides lower cost of storage and higher cost of access.

- **Archive Access Tier :** This is design for infrequent access data. It is intended for use in cases where data is kept for more than 180 days.

Container : In a file system, a container organizes a set of blobs, similar to a directory.
A storage account can contain an infinite number of containers, and a container can store infinite blobs.

Microsoft Azure Storage Types

There are **three different ways to store Blobs** in Microsoft Azure:

Blob Storage

Block Blobs

Used for storing text or binary files like large images and videos

Append Blobs

Used for storing logging and monitoring data

Page Blobs

Mainly used for disks like VMs disks and Azure SQL

Microsoft Azure Storage Types

- **Block Blob**: The default and **most frequent type** of Blob Storage is Block Blob. It is intended for the storage of vast amounts of unstructured data, such as text and binary data. Block Blob allows users to upload data in blocks and supports up to **4.75 TB of data per blob**, allowing for efficient and reliable uploading and downloading of huge files.

- **Append Blob**: Append Blob is intended for instances in which data must be added to an existing blob, such as logging and auditing. It allows **users to append data to the end of the blob** without changing the existing data and supports up to **195 GB of data per blob**. This allows for the quick and dependable writing of data streams such as log files.

- **Page Blob**: Page Blob is intended to hold random access files, such as VHD pictures used by virtual machines. It can store up to **8 TB of data per blob** and **allows users to read and write** data in arbitrary chunks or pages. This makes it appropriate for cases requiring **frequent updates and random data access**, such as OS drives or database storage.

Microsoft Azure Storage Types

2. Azure Table Storage

Microsoft Azure cloud service offers Azure Table Storage as a service to **store and manage the big volume of structured NoSQL data (Big Data) on the cloud**. Table storage stores data in **keys-value format** by using **schema-less design** and due to schema-less property this service can be scaled dynamically and also adapts to the data as data changes evolve with time.

It can **scale upto terabytes of data and a queryable API with OData** (Open Data Protocol). OData is a standard portocol for querying and updating data over the web.

Azure Table storage service is cost-effective and also has low latency while reading and writing data from tables. Compared to traditional relational or SQL database storage It is very low in cost for the same volume of data and It can. also store data coming from web apps, IoT devices, or other metadata which is flexible can increase and decrease datasets easily.

Microsoft Azure Storage Types

Architecture of Azure Table Storage

Azure Table Storage can store a huge volume of data in NoSQL datastores and users can query this structured and non-relational data to read and write tables. To store this data Azure table storage has certain architecture. In a single table, users can store one or more entities. All these entities are stored in a Storage Account. A storage account can also have one or more tables based on the capacity of the storage account.
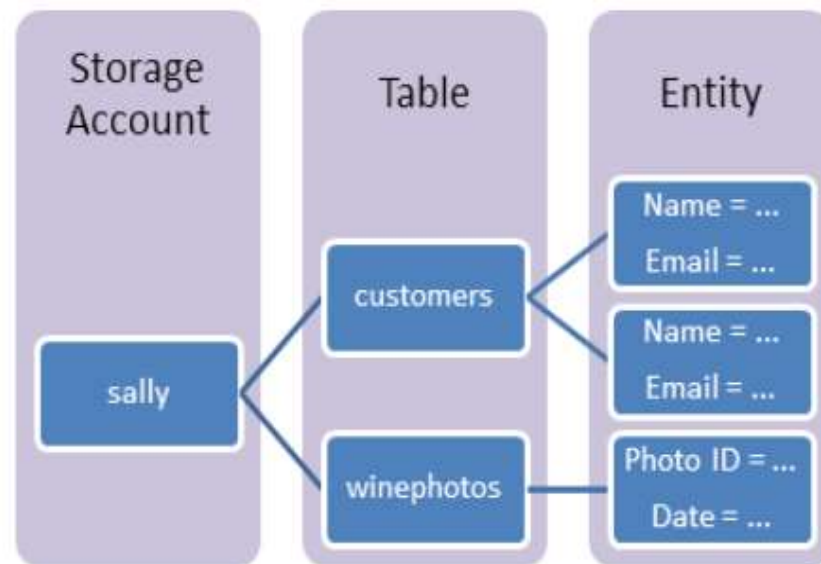
Microsoft Azure Storage Types

1. Storage Account

Azure Storage Account is used to provide and manage all the access related to the storage account and It is the basic building block of the Azure services. To transfer or migrate the data from one service in the storage user needs to have a storage account as it provides a unique namespace. It contains all the data objects used in Azure like Blob Storage, File Storage, Queues, disks, and Azure Table storage. So to access Azure Table Storage service users need to create a storage account.

2. Table

It is a collection of one or more schemaless entities. Azure tables do not impose the schema so that one table can store various types of entities with different properties.

3. Entity

It is the same as a row in a database with a set of properties. An entity can store the data up to 1MB of size in Azure storage and Azure Cosmos Database can store the entity with size 2MB.

4. URL Format

In Azure storage account is created with unique namespace and the URL format of this storage account as below:

Azure Storage Format: http://<storage_account_name>.table.core.windows.net/<table_name>
Azure Cosmos Db Format: http://<storage_account_name>.table.cosmosdb.azure.com/<table_name>

Microsoft Azure Storage Types

3. Azure Queue Storage

When your services need to communicate with each other

Queue Storage is **designed to connect the components of your application**. It allows you to build flexible applications with independent components that rely on **asynchronous message queuing**.
 The issues concerning asynchronous communication that you have to deal with in such case:
- ✓ The necessity to have both the receiver and the sender available simultaneously. Needless to say, if one of them goes down, the communication terminates.
- ✓ Mandatory implementation of try/retry logic to provide for a possible outage.
- ✓ Lack of proper scalability.

However, all of that can be avoided simply by **using a mediator that will collect the messages** while one of the communication partners is down. With Azure Queues, you have a third player that connects the two components and acts as both a **buffer and a mediator**.

Microsoft Azure Queue storage is a service used for storing the **various large number of messages** which need to be accessed from any region in the world. As it uses Azure data centers worldwide, these calls should come via authenticated calls using HTTP or HTTPS.
Azure Queue Storage can also be used to create a **backlog of work to process** asynchronously.
Azure Queue storage can **store millions of incoming messages** up to the total capacity of the
 storage account, and each message size can be up to 64 KB. It is also cost-effective storage which queues up all the incoming calls and messages them between different applications.

Microsoft Azure Storage Types

The Architecture of Azure Queue Storage

Microsoft Azure Queue Storage supports managing asynchronous tasks and building the process of workflows.
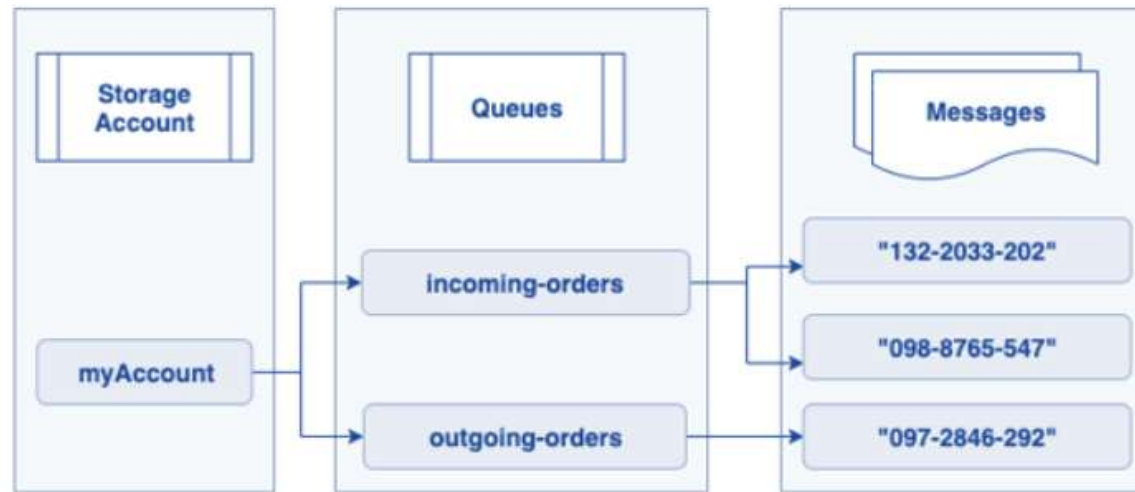
1. URL Format

In this account, queues are created with a unique namespace and are addressable using the URL format of this storage account

http://<storage_account_name>.queue.core.windows.net/<queue_name>

Microsoft Azure Storage Types

2. Storage Account

This is used to provide and manage all the access related to the storage account, and It is the basic building block of the Azure services. To transfer or migrate the incoming orders from one application to another, the storage user needs to have a storage account as it provides a unique namespace. It contains all the data objects used in Azure, like Blob Storage, File Storage, Queues Storage, disks, and Azure Table Storage. So to access Azure Table Storage service, users need to create a storage account.

3. Queue

This is the set of messages in the queue, and the queue name needs to be in lowercase and unique with a valid DNS name with 3 to 63 characters.

4. Message

This can store a single message up to 64 KB in any format. The queue storage capacity (maximum time to live) of the older version came before 2017-07-29 was 7 days. The latest version came after 2017-07-29. Has maximum time to live is any positive number or -1 so that message does not expire. If the above maximum time-to-live parameter is not set in the newest version by default message queued capacity is 7 days.

Microsoft Azure Storage Types

Azure supports **two types of queue mechanisms**:

- **Storage queues.**
  Being part of the Azure storage infrastructure, they feature a simple REST-based GET/PUT/PEEK interface with reliable and persistent messaging within and between services.

- **Service Bus queues**
  They are part of a broader Azure messaging infrastructure that supports queuing as well as more advanced integration patterns.

Microsoft Azure Storage Types

4. Azure File Storage (AFS)

Azure File Storage is a **fully managed file share service** that provides **shared storage using the Server Message Block (SMB) and Network File System (NFS) protocols**. File Storage allows users to create and mount file shares that can be accessed by multiple users or applications from any device. Azure File Storage also supports POSIX compliance, integration with container platforms, and Active Directory authentication.

Azure File Storage Components
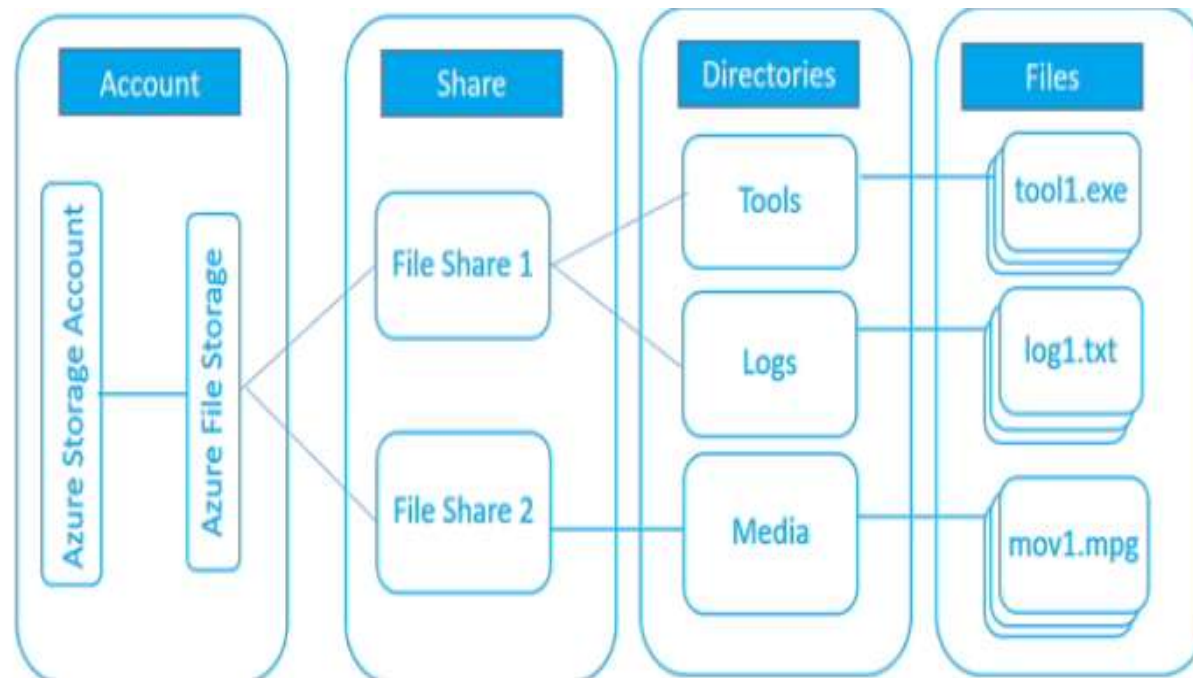
Microsoft Azure Storage Types

Azure File Storage Components

1. Azure Storage Account
- Microsoft Azure's Storage Account will offer access to all the storage objects available in Azure such as Queue, Blob, Files, Tables and disks.
- It consists of a unique name the users can access globally. Storage accounts offer options for various configurations for the users to use the resources.
- It also provides information on the resources that are available so that it helps the users to manage the storage account limitation and distribute equally across all the storage services.

2. Azure Storage Shares
- Microsoft Azure follows the industry-standard SMB protocol for sharing the files and directories to the cloud.
- SMB file share holds all the files and directory inside it and also allows the user to create their files and directory inside the SMB, but the users should also remember that they cannot create their files and directory in the storage account.
- Every Azure Account can have unbounded share numbers and every share is capable of having multiple files. Azure builds file storage shares before loading or creating any file or directory.
- Once the file directory is successfully created then the user can use the same directory to upload the files and directory.

Microsoft Azure Storage Types

Azure File Storage Components

3. Microsoft Azure Directory

Microsoft's Azure directory follows a hierarchy file system or directory system depending upon the particular category such as documents. Logs and media related files that are stored inside a particular categorical directory.

4. Microsoft Azure Files

Users create files or they can upload them inside the Azure Storage shares. These files can be built in any format such as **text, CSV, image or with any application**. Azure files have the capability to support identity-based authentication over the SMB protocol.

5. URL Format

URL format is required if any request is made for the Azure share with the help of REST protocol and the syntax of the URL should be as follows:

https://<storage_account_name>.file.core.window.net/<storage_share_name>/<direcotory_name>/<file_name>

Microsoft Azure Storage Types

5. Azure Disk Storage

Azure Disk Storage is a **block-level storage service** that provides virtual hard disks (VHDs) that can be attached to Azure Virtual Machines or Azure VMware Solution. A disk created in Disk Storage can be accessed from only one virtual machine. it is your local drive.

It offers **two options for the speed** of your disks to meet different performance and cost requirements :

HDDs that are cheap but slow and called **standard** storage.
**SSDs** that are fast but expensive and called **premium** storage.

And **two options for disk management**:

Unmanaged disk - you should manage the disk storage and corresponding account yourself
Managed disk - Azure does everything for you. You need to select only the size of the disk and the desired type - standard or premium

Azure Disk Storage provides **high durability, availability, and security for your data**.

Microsoft Azure Storage Types
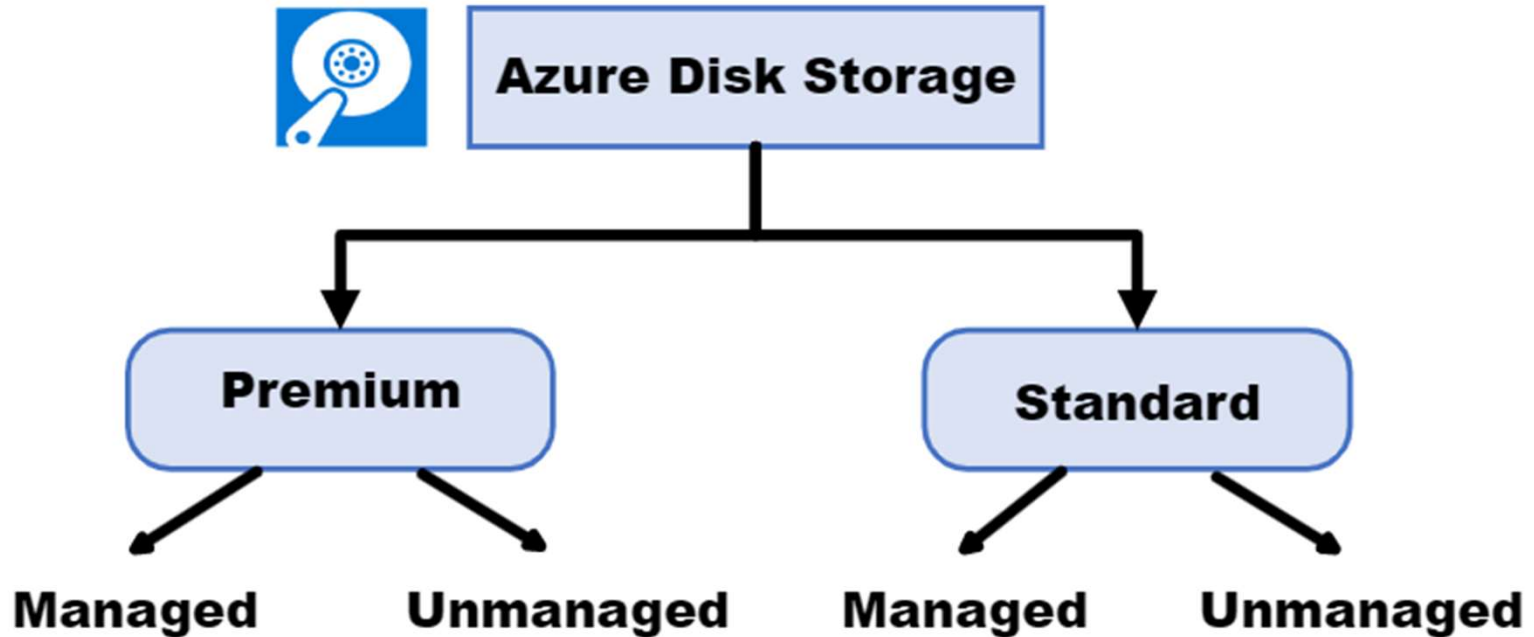
Microsoft Azure Storage Types

Azure Unmanaged Disks

Unmanaged disks are among Azure's earlier storage solutions, where you are responsible for creating and managing storage accounts themselves. This means you can independently oversee the performance and capacity of their storage accounts. While this hands-on approach offers greater control over storage configurations, it requires proactive management to ensure the best performance and scalability.

Microsoft Azure Storage Types

Features of Azure Unmanaged Disks

An Azure unmanaged disk has the following features.

- **Granular Control:** Unmanaged disks empower you with direct control over storage accounts, enabling them to finely tweak configuration and management based on their specific needs.
- **Flexibility:** With unmanaged disks, you can either utilize existing storage accounts or create new ones tailored to their preferences and requirements.
- **Customization:** Unmanaged disks offer extensive customization options, allowing you to optimize storage settings and configurations to achieve tailored performance and cost objectives.

- **Legacy Support:** While managed disks provide advanced storage management capabilities, there are scenarios where unmanaged disks are preferable due to the demand for legacy systems or specific configurations.
- **Cost Considerations:** Although unmanaged disks offer flexibility, it's important to note that they may entail more manual effort in terms of provisioning, scaling, and cost management compared to managed disks.

Microsoft Azure Storage Types

Azure Managed Disks

An [Azure-managed disk](#) is similar to a physical disk found in a physical on-prem server, but it's virtualized. It's a block-level storage volume used with Azure VMs and managed by Microsoft Azure.

For starters, managed disks are designed for 99.999% availability. That's five-nines of availability. To achieve this level of availability, there are three replicas of the data stored on each managed disk. This type of durability protects you from one or two failures of disk replicas.
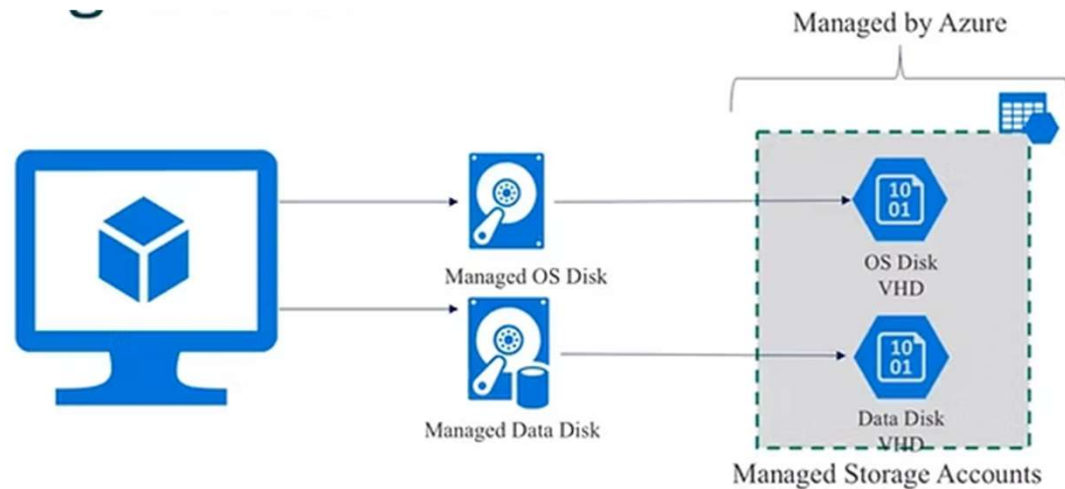
Microsoft Azure Storage Types

Features Of Azure Managed Disks

Azure managed disks have the following set of features.

- **Ease of management**: The hassle of handling storage accounts is removed with managed disks. Azure takes care of all the provisioning, scaling, and maintenance tasks, saving you from administrative burdens.

- **Seamless integration and automation**: Managed disks seamlessly work with each other Azure services, allowing for automated backups, snapshots, and integration with Azure Availability Sets and Virtual Machine Scale Sets.

- **Scalability and exceptional performance**: Need to resize your disks? No problem! Managed disks provide flexible scalability options without any downtime. They come in different performance tiers to satisfy various performance and cost preferences, including Premium SSD, Standard SSD, and Standard HDD.

- **Security and reliability**: Managed disks ensure data security and reliability. They offer built-in encryption when at rest and are designed to guarantee high availability and durability. Azure takes care of the underlying infrastructure, ensuring data integrity and reliability.

- **Cost management**: With Managed disks, pricing becomes straightforward, and billing becomes simple. You no longer have to juggle different storage accounts as cost management becomes a breeze.

The Difference: Azure Blob Storage vs File Storage vs Disk Storage

Storage Category	Azure Blob Storage	Azure File Storage	Azure Disk Storage
Object Storage	Primary use case for storing unstructured data such as text, images, videos, and backups	Not suitable for storing unstructured data; mainly used for sharing files across multiple machines in a distributed environment	Not suitable for storing unstructured data; mainly used for hosting VM disks and persistent storage for Kubernetes
Durability and Availability	Provides high durability and availability of data with built-in redundancy and replication across multiple regions	Provides durability and availability of data with built-in redundancy across multiple nodes in the same region	Provides durability and availability of data with built-in redundancy within the same availability set or availability zone
Performance	Provides high throughput and scalability for read-intensive workloads	Provides low latency and high throughput for read/write operations on small files	Provides low latency and high throughput for read/write operations on large disks

The Difference: Azure Blob Storage vs File Storage vs Disk Storage

Storage Category	Azure Blob Storage	Azure File Storage	Azure Disk Storage
Reliability	Data stores in Blob Storage are highly durable and reliable with very low chances of data loss. Blob storage automatically creates multiple replicas of your data, and each replica is stored in a different storage scale unit.	The data stored in File Storage are highly durable and reliable with very low chances of data loss. The service automatically stores multiple replicas of your data in different storage scale units to ensure data durability.	Data stores in Disk Storage are not durable and reliable as compared to Blob Storage and File Storage. Azure Disk Storage provides durability based on the type of disk you choose.
Cost	Cost-effective for storing large amounts of data that is not accessed frequently. Cost depends on the amount of data stored per month,	Cost-effective for sharing files across multiple machines; may be more expensive than Blob storage for large amounts of data,	More expensive than Blob and File storage; suitable for performance-critical workloads. Pricing depends on the size of the disks per month, the number of transactions performed on the disks, and the data transfer costs.