**Azure Storage Services Overview**

Azure provides different storage services to meet different needs like file storage, block storage, unstructured data, and messaging.

**🔹 1. Azure Blob Storage (Binary Large Object)**

**📌 What is it?**

* Object storage for **unstructured data** like images, videos, logs, backups.

**📦 Use Cases:**

* Storing files, backups, media files, and large datasets
* Data lakes and analytics
* Static website hosting

**📁 Blob Types:**

* **Block Blob** – for text and binary data (most common)
* **Append Blob** – optimized for log data (append-only)
* **Page Blob** – used for Azure Virtual Machine disks

**🔹 2. Azure File Storage**

**📌 What is it?**

* **Managed file share** that you can mount via **SMB or NFS protocol**

**📦 Use Cases:**

* Shared storage for applications (like NAS)
* File server replacement
* Lift-and-shift legacy apps that expect file shares

**🔹 3. Azure Queue Storage**

**📌 What is it?**

* Message queuing for **decoupling components** of a distributed application

**📦 Use Cases:**

* Store and manage messages between services
* Reliable communication between microservices
* Task scheduling systems

**🔹 4. Azure Table Storage (now part of Cosmos DB)**

**📌 What is it?**

* NoSQL key-value store for **structured, non-relational data**

**📦 Use Cases:**

* Lightweight, fast storage for logs, telemetry, metadata
* Scenarios needing fast lookups and massive scale
* Now recommended to use **Azure Cosmos DB Table API**

**🔹 5. Azure Disk Storage**

**📌 What is it?**

* **Block-level storage** for Azure Virtual Machines (VMs), similar to SAN

**📦 Use Cases:**

* Operating systems and application data for VMs
* Databases and transactional workloads
* Backup and disaster recovery

**📁 Types:**

| **Type** | **Description** |
| --- | --- |
| **Premium SSD** | High-performance SSD for IO-intensive apps |
| **Standard SSD** | Balanced cost and performance |
| **Standard HDD** | Cost-effective for infrequent access |
| **Ultra Disk** | Extreme IOPS and throughput for critical workloads |

✅ **Azure Disk Storage is equivalent to AWS EBS (Elastic Block Store)**.

Both are **block-level storage** services used for **attaching virtual disks to cloud VMs**.

**🔄 Azure Disk Storage vs AWS EBS – Comparison Table**

| **Feature** | **Azure Disk Storage** | **AWS EBS (Elastic Block Store)** |
| --- | --- | --- |
| **Type** | Block storage | Block storage |
| **Attach To** | Azure Virtual Machines (VMs) | Amazon EC2 Instances |
| **Persistence** | Persistent (retains data after shutdown) | Persistent |
| **Access** | Over the network, but appears as local disk | Same |
| **Encryption** | Enabled by default (Azure-managed keys or BYOK) | Enabled by default |
| **Snapshots** | Supported (stored in Azure Blob Storage) | Supported (stored in Amazon S3) |
| **Backup** | Azure Backup service | AWS Backup |
| **Zonal/Regional** | Zonal, ZRS (Zone-redundant available) | Single AZ or Multi-AZ with Snap Replication |

**📦 Disk Types Comparison**

| **Use Case** | **Azure Disk** | **AWS EBS** |
| --- | --- | --- |
| High IOPS/Throughput | **Ultra Disk** | **io2 Block Express** |
| General Purpose SSD | **Premium SSD (v2/v1)** | **gp3 / gp2** |
| Balanced SSD | **Standard SSD** | **st1** (for throughput) |
| Low-cost, low-perf | **Standard HDD** | **sc1** |

**✅ Key Similarities:**

* Both are:
  + **Durable, scalable block storage**
  + Used as **OS disks, data disks, or for database volumes**
  + Allow **snapshots and backup**
  + Support **encryption, resizing, and performance tiers**

**🔍 Example Use Case:**

| **Scenario** | | **Azure** | | **AWS** | |
| --- | --- | --- | --- | --- | --- |
| Deploy a VM with a fast SSD disk for SQL Server | | Azure VM + Premium SSD | | EC2 + EBS gp3/io2 | |
| Backup the disk to blob/S3 | Azure Backup + Snapshot | | EBS Snapshot (stored in S3) | |

**Managed Disks vs Unmanaged Disks in Azure**

**🔹 1. Managed Disks**

**📌 What is it?**

A **fully managed** disk solution by Azure. You don't manage the underlying storage account — Azure handles **scaling, replication, encryption, and availability** for you.

**🧠 Key Features:**

* Azure **manages the storage account**
* Scalable without hitting storage account limits
* **Built-in high availability** and durability (3x replication)
* **Simpler backup, snapshot, and encryption** options
* Supports **availability zones**, disk bursting, and Ultra SSDs

**📦 Use Cases:**

* Recommended for **production workloads**
* Used with Azure VMs (OS & Data Disks)
* Ideal for scalable, secure, high-performance apps

**🔸 Example:**

When you create a VM and choose "Use managed disk" – Azure automatically creates a disk resource (/subscriptions/.../resourceGroups/.../providers/Microsoft.Compute/disks/...), not a blob file.

**🔹 2. Unmanaged Disks (Legacy)**

**📌 What is it?**

You **manually create and manage the VHD files** in a **Storage Account (Blob Storage → Page Blob)**.

**🧠 Key Features:**

* You must manage:
  + Storage account limits (20,000 IOPS per account)
  + Blob container permissions
* **Less scalable and more complex**
* Disk is a **.vhd file stored as a page blob**
* Snapshot and encryption setup is manual

**📦 Use Cases:**

* Used in **legacy systems**
* Used when you need **direct control of VHD blobs**
* Not recommended for new deployments

**🔸 Example:**

You upload a .vhd file to a Blob Storage account, then create a VM using that as an unmanaged disk.

**Real-World Example: Managed vs Unmanaged Disks**

**🎯 Scenario:**

You are deploying a **Windows Server Virtual Machine** in Azure to run a web application.

**🔷 Using Managed Disk (Recommended and Modern Approach)**

**👣 Steps:**

1. Go to **Azure Portal > Virtual Machines > Create VM**
2. In the **"Disks"** tab:
   * Select **OS disk type**: *Premium SSD*
   * Azure creates a **Managed Disk** resource for the OS disk automatically.
3. You don’t choose or manage any **Storage Account**.
4. You can later:
   * Resize the disk
   * Take snapshots (for backup)
   * Encrypt the disk
   * Use availability zones

**📌 Result:**

* Disk is created as a **managed resource**:

bash

/subscriptions/<id>/resourceGroups/MyRG/providers/Microsoft.Compute/disks/WebServerDisk

* Azure takes care of storage performance, redundancy, etc.

**✅ Advantages:**

* No need to manage .vhd files
* Simple, scalable, and high-performing
* Works with disk encryption and zone redundancy

**🔶 Using Unmanaged Disk (Legacy Approach)**

**👣 Steps:**

1. First, go to **Azure Storage Account > Blob Containers**.
2. Upload a .vhd file manually (a virtual hard disk image).
   * Stored in **Page Blob format** under a container like:

Arduino

https://mystorageaccount.blob.core.windows.net/vhds/webserver.vhd

1. Go to **Azure Portal > Virtual Machines > Create VM**
2. In the **"Disks"** tab:
   * Select **"Use existing VHD"**
   * Point to the .vhd file in the blob container.
3. Azure uses this VHD as the **OS Disk**, but:
   * You must manage the **Storage Account**
   * You're limited by account IOPS and size limits

**🚫 Result:**

* Disk is not a separate Azure resource
* It's just a .vhd inside Blob Storage

**⚠️ Disadvantages:**

* You must monitor storage account limits manually
* No availability zone support
* Snapshots and backups are harder to manage
* Legacy method—**not recommended**

**🔁 Summary of the Example:**

| **Item** | **Managed Disk** | **Unmanaged Disk** |
| --- | --- | --- |
| Disk Location | Azure-managed disk resource | .vhd file in Blob Storage |
| Created When? | Automatically during VM creation | Manually upload .vhd to blob, then use it |
| Scalability | Automatically scalable | Limited by storage account (20k IOPS max) |
| Storage Account Needed? | ❌ No | ✅ Yes |
| Recommended by Microsoft | ✅ Yes | ❌ No (legacy only) |

**🧠 Summary in One Line:**

**Managed Disk** = Just click and go (Azure handles everything)  
**Unmanaged Disk** = You manually upload and manage a .vhd in Blob Storage (old way)