**Azure Storage Services – Deep Dive (Day 7 Learning)**

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Azure Storage is a **core cloud service** that provides **scalable, durable, and highly available** storage for modern applications. Below is a **comprehensive breakdown** of all the concepts you learned today.

**1. What is Azure Storage Service & When to Use It?**

**Definition**

Azure Storage is a **Microsoft-managed cloud storage solution** that offers:

* **Massive scalability** (petabyte-scale storage).
* **High availability** (99.9% - 99.99% SLA).
* **Security & Compliance** (encryption, RBAC, private endpoints).
* **Multiple data access models** (Blobs, Files, Tables, Queues, Disks).

**When to Use Azure Storage?**

✔ **Unstructured Data** (Blobs – Images, Videos, Logs).  
✔ **File Sharing Across VMs/Cloud** (Azure Files).  
✔ **NoSQL Structured Data** (Table Storage).  
✔ **Message Queues for Decoupled Apps** (Queue Storage).  
✔ **Static Website Hosting** (Blob Storage).

**2. Types of Azure Storage Services**

| **Service** | **Use Case** | **Example** |
| --- | --- | --- |
| **Blob Storage** | Storing unstructured data (images, backups, logs). | Hosting a video library. |
| **Azure Files** | Shared file storage (SMB/NFS). | Centralized company documents. |
| **Table Storage** | NoSQL key-value storage. | Storing IoT device metadata. |
| **Queue Storage** | Decoupling app components. | Order processing queue. |
| **Disk Storage** | VM persistent disks (SSD/HDD). | Running a SQL Server VM. |

**3. Azure Blob Storage – When & How to Use?**

**What is Blob Storage?**

* Stores **unstructured data** (binary/text) in **containers**.
* Three tiers:
  + **Hot** (frequent access).
  + **Cool** (infrequent access, cheaper).
  + **Archive** (long-term backup, lowest cost).

**Example Use Case**

* **Storing user-uploaded images** in a web app.
* **Backup & Disaster Recovery** (retain for years).

**How to Create a Blob Container?**

bash

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az storage container create --name "mycontainer" --account-name "mystorageaccount"

**4. Azure File Share – When & How to Use?**

**What is Azure Files?**

* Fully managed **file shares** accessible via **SMB/NFS**.
* Can be mounted on **VMs, on-premises, or cloud apps**.

**Example Use Case**

* **Centralized company files** accessed by multiple VMs.
* **Lift-and-shift migration** of on-prem file servers.

**How to Create a File Share?**

bash

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az storage share create --name "myshare" --account-name "mystorageaccount"

**5. Azure Table Storage – When & How to Use?**

**What is Table Storage?**

* **NoSQL key-value store** for semi-structured data.
* **Schemaless**, low-cost, high-performance.

**Example Use Case**

* **Storing IoT sensor data** (deviceId, timestamp, value).
* **User session data** for web apps.

**How to Create a Table?**

bash

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az storage table create --name "mytable" --account-name "mystorageaccount"

**6. Azure Queue Storage – When & How to Use?**

**What is Queue Storage?**

* **Message queue** for decoupling app components.
* **Asynchronous processing** (e.g., order processing).

**Example Use Case**

* **Order processing system** (queue orders for backend processing).
* **Auto-scaling trigger** (queue depth monitoring).

**How to Create a Queue?**

bash

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az storage queue create --name "myqueue" --account-name "mystorageaccount"

**7. What is an Azure Storage Account?**

* A **top-level container** for all storage services (Blobs, Files, Tables, Queues).
* **Defines:**
  + **Performance tier** (Standard/Premium).
  + **Replication strategy** (LRS, ZRS, GRS, etc.).
  + **Access control** (RBAC, Shared Access Signatures).

**Types of Storage Accounts**

| **Type** | **Best For** |
| --- | --- |
| **General-Purpose v2** | Most scenarios (Blobs, Files, Tables, Queues). |
| **BlockBlobStorage** | High-performance block blobs. |
| **FileStorage** | Premium file shares (high IOPS). |

**8. Redundancy Options (Replication Strategies)**

| **Type** | **Description** | **When to Use?** |
| --- | --- | --- |
| **LRS (Locally Redundant)** | 3 copies in one datacenter. | Non-critical data (dev/test). |
| **ZRS (Zone-Redundant)** | 3 copies across availability zones. | High availability in one region. |
| **GRS (Geo-Redundant)** | 6 copies (3 in primary + 3 in secondary region). | Disaster recovery (auto-failover). |
| **RA-GRS (Read-Access GRS)** | GRS + read access to secondary region. | Global read access (CDN-like). |

**9. Static Website Hosting**

* **Host static websites (HTML, CSS, JS) directly from Blob Storage.**
* **Example:**

bash

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az storage blob service-properties update --account-name "mystorage" --static-website --index-document "index.html"

* **URL Format:**  
  https://<account-name>.z<number>.web.core.windows.net

**10. Storage Browser (Azure Portal Tool)**

* **Web-based GUI** to manage Blobs, Files, Tables, Queues.
* **Use Cases:**
  + Quick file upload/download.
  + Managing permissions (SAS tokens).
  + Viewing logs & metrics.

**11. Security & Availability**

**Security Features**

✔ **Encryption at Rest** (Azure-managed keys or Customer-managed keys).  
✔ **Encryption in Transit** (TLS 1.2+).  
✔ **Private Endpoints** (restrict to VNet).  
✔ **RBAC & SAS Tokens** (granular access control).

**Availability**

* **99.9% SLA** (for LRS/ZRS).
* **99.99% SLA** (for GRS/RA-GRS).