Microsoft Azure Administrator Associate Training

Implement and Manage Storage

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- Replication
- Differences
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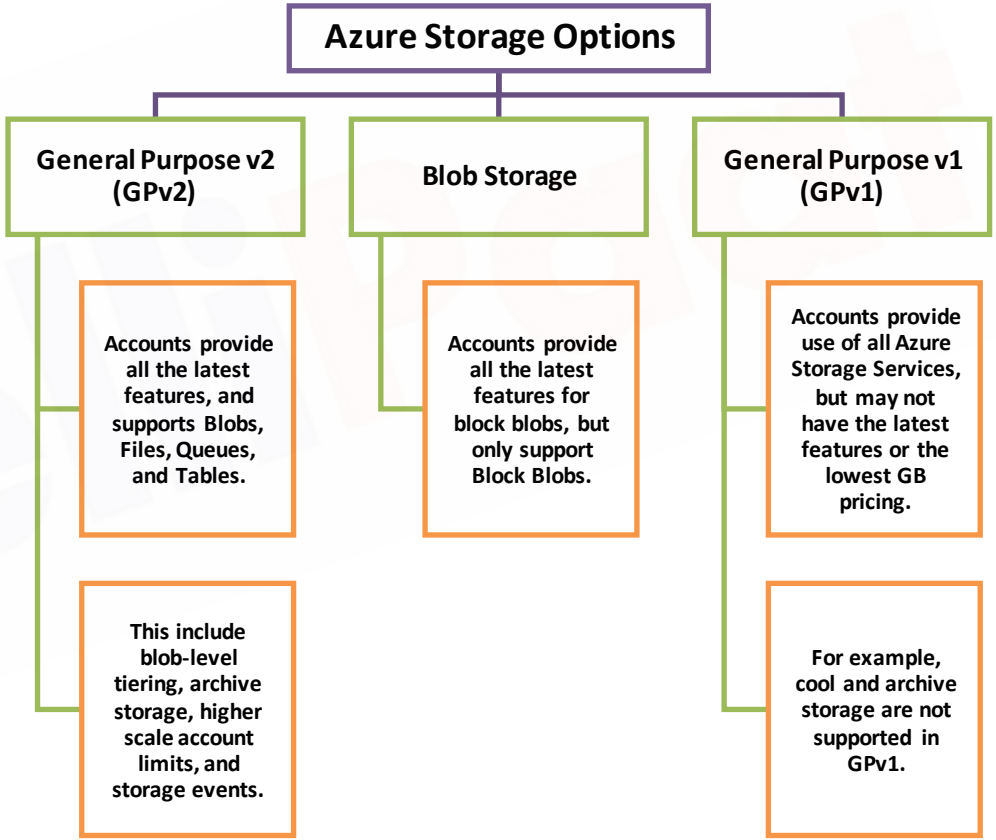
- Backup and Retention
- Pricing
- Hands-On Lab

Azure Storage

What is Azure Storage?

- Azure Storage provides storage that is highly available, secure, durable, scalable, and redundant.
- Azure Storage offers below data services:
  - Blob Storage
  - File Storage
  - Queue Storage
  - Table



Azure Storage:
General Purpose v2

- General Purpose v2 (GPv2) are storage accounts which support all features for all storage services, including Blobs, Files, Queues, and Tables.
- For Block Blobs, You can choose between hot and cool storage tiers at account level, or hot, cool, and archive tiers at the blob level based on access patterns.
- Store frequently, infrequently, and rarely accessed data in the hot, cool, and archive storage tiers respectively to optimize costs.
- Importantly, any GPv1 account can be upgraded to a GPv2 account in the portal, CLI, or PowerShell.

Azure Storage: Pricing

- All storage accounts use a pricing model for blob storage based on the tier of each blob.

- When using a storage account, the following billing considerations apply:

Storage costs

- The cost of storing data varies depending on the storage tier.
- The per-gigabyte cost decreases as the tier gets cooler.

Data access costs

- Data access charges increase as the tier gets cooler.
- For data in the cool and archive storage tier, you are charged a per-gigabyte data access charge for reads.

Transaction costs

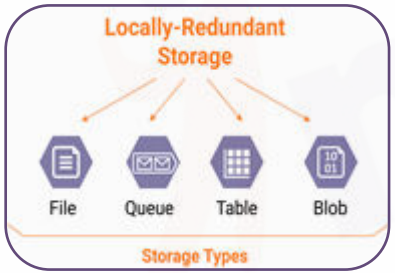
- There is a per-transaction charge for all tiers.

Geo-Replication data transfer costs

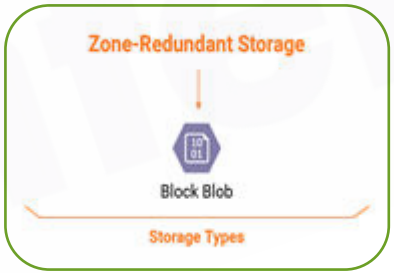
- This only applies to accounts with geo-replication configured, including GRS and RA-GRS.
- Geo-replication data transfer incurs a per-gigabyte charge.

Azure Storage: Replication

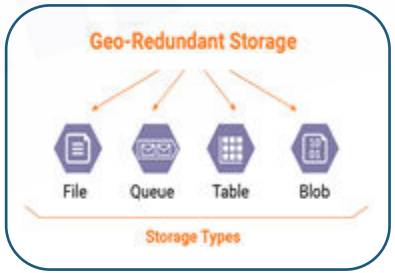
- The data in your Microsoft Azure storage account is always replicated to ensure durability and high availability.
- Replication copies your data, either within the same data center, or to a second data center, depending on which replication option you choose.
- When you create a storage account, you can select one of the following replication options:



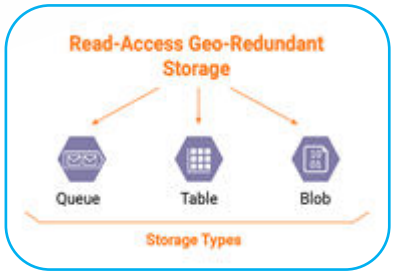
Locally Redundant Storage (LRS)



Zone-redundant Storage (ZRS)



Geo-redundant Storage (GRS)



Read-Access Geo-redundant Storage (RA-GRS)

Azure Storage: Differences

Replication Strategy	LRS	ZRS	GRA	RA-GRS
Data is replicated across multiple datacenters.	No	Yes	Yes	Yes
Data can be read from a secondary location as well as the primary location.	No	No	No	Yes
Designed to provide _ durability of objects over a given year.	At least 99.999999999 % (11 9's)	At least 99.9999999999 % (12 9's)	At least 99.99999999 999999% (16 9's)	At least 99.99999999999 999% (16 9's)

Azure Storage: Tiers

Azure storage offers three storage tiers for Blob object storage:

Hot Storage Tier

The Azure hot storage tier is optimized for storing data that is accessed frequently.

Cool Storage Tier

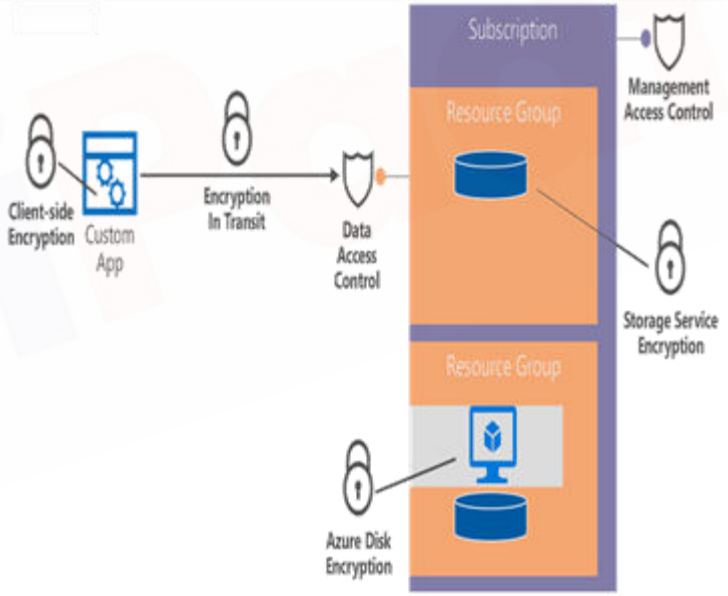
The Azure cool storage tier is optimized for storing data that is infrequently accessed and stored for at least 30 days.

Archive Storage Tier

The Azure archive storage tier is optimized for storing data that is rarely accessed and stored for at least 180 days.

Azure Storage: Security

- Azure Storage provides a comprehensive set of security capabilities.
- The storage account itself can be secured using Role-Based Access Control and Azure Active Directory.
- Data can be secured in transit between an application and Azure by using Client-Side Encryption, HTTPS, or SMB 3.0.
- Data can be set to be automatically encrypted when written to Azure Storage using Storage Service Encryption.
- OS and Data disks used by virtual machines can be set to be encrypted using Azure Disk Encryption.
- Delegated access to the data objects in Azure Storage can be granted using Shared Access Signatures.



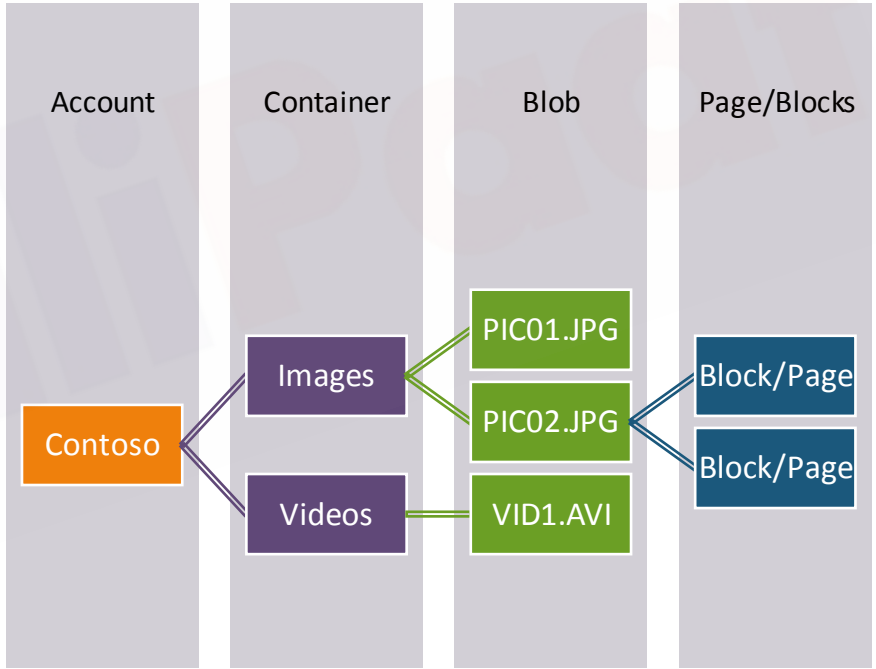
Azure Blob Storage

What is Azure Blob Storage?

- Azure Blob storage is a service for storing large amounts of unstructured object data, such as text or binary data.
- You can use Blob storage to expose data publicly to the world, or to store application data privately.
- Common uses of Blob storage include:
  - Serving images or documents directly to a browser
  - Storing files for distributed access
  - Storing data for backup and restore, disaster recovery, and archiving

Azure Blob: Concept

- **Storage Account**
  - All access to Azure Storage is done through a storage account.
  - This account can be a General-purpose or a Blob storage.
- **Container**
  - A container provides a grouping of a set of blobs.
  - All blobs must be in a container.
  - An account can contain an unlimited number of containers.
  - A container can store an unlimited number of blobs.
- **Blob**
  - A file of any type and size.
  - Azure Storage offers three types of blobs
    - **Block Blobs**
    - **Page Blobs**
    - **Append Blobs**



Azure Blob: Types

Block Blobs

- Each block can be a different size, up to a maximum of 100 MB.
- Used for storing text or binary files, such as documents and media files.
- A single block blob can contain up to 50,000 blocks. Individual block blobs can be up to 4.75 terabytes (TB) in size (100 MB X 50,000).
- With a block blob, you can upload multiple blocks in parallel to decrease upload time.

Append Blobs

- Each block in an append blob can be a different size, up to a maximum of 4 MB.
- Are similar to block blobs in that they are made up of blocks, but they are optimized for append operations, so they are useful for logging scenarios.
- A single append blob can contain up to 50,000 blocks, for a total size of slightly more than 195 GB (4 MB X 50,000).

Page Blobs

- Page blobs are a collection of 512-byte pages optimized for random read and write operations.
- Can be up to 8 TB in size, and are more efficient for frequent read/write operations.
- Azure Virtual Machines use page blobs as OS and data disks.

Azure Blob: Container

- You can store blobs directly in the root container of the storage account or create custom containers in which to store blobs.
- Users can access the Blob through a unique URL.

- **Example**
  - "**myblob.jpg**" in a container named "**mycontainer**" in a storage account named "**myaccount**" by using the
    - http://myaccount.blob.core.windows.net/mycontainer/myblob.jpg

Azure Blob: Access Level

When you create a container, you must give it a name and choose the level of access that you want to allow from the following options:

Private

This is the default option. The container does not allow anonymous access.

Public Blob

This option allows anonymous access to each blob within the container; however, it prevents browsing the content of the container.

In other words, it is necessary to know the full path to the target blob to access it.

Public Container

This option allows anonymous access to each blob within the container, with the ability to browse the container's content.

Azure File Storage

What is Azure Files Storage?

- Azure Files offers fully managed file shares in the cloud that are accessible via Common Internet File System (CIFS).
- Azure File shares can be mounted concurrently by cloud or on-premises deployments of Windows, Linux, and macOS.
- Additionally, Azure File shares can be cached on Windows Servers with Azure File Sync for fast access near where the data is being used.
- The maximum size for an Azure File share is 5 TiB.
- Azure Storage account, can store multiple shares with a total of 500 TiB stored across all shares.
- Azure Files supports two data redundancy options:
  - Locally redundant storage (LRS)
  - Geo-redundant storage (GRS)

Azure Files: Use Cases

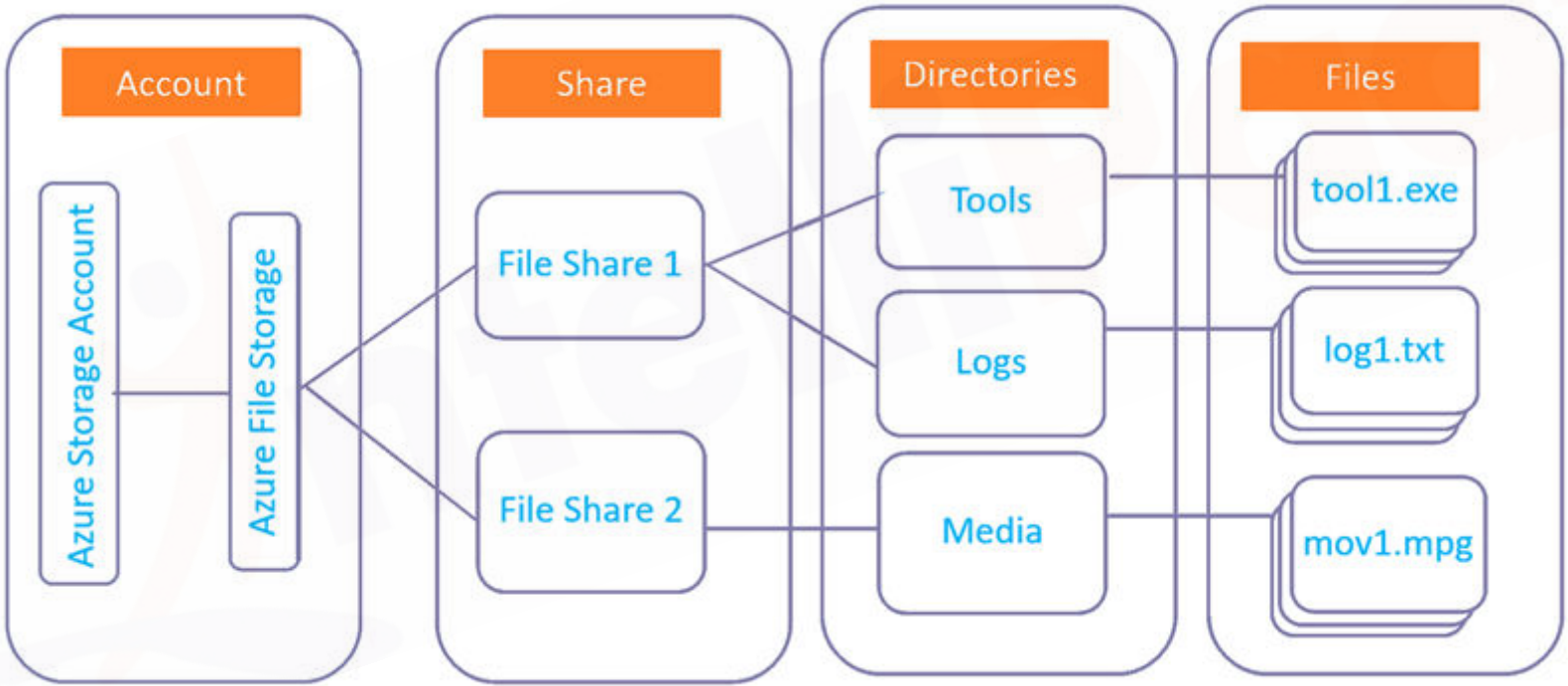
Replace or supplement on-premises file servers

- Azure Files can be used to completely replace or supplement traditional on-premises file servers or NAS.

"Lift and shift" applications

- Azure Files makes it easy to "lift and shift" applications to the cloud that expect a file share to store file application or user data.

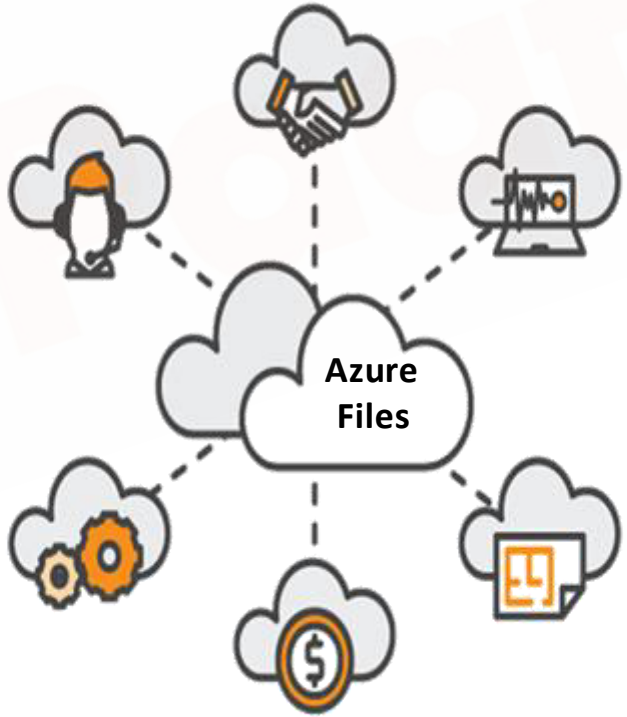
Azure Files:
Constructs



Azure Files: Management

- An account can contain an unlimited number of shares, and a share can store an unlimited number of files, up to the 5 TiB total capacity of the file share.
- A file in the share. A file may be up to 1 TiB in size.
- **URL format**
  - For requests to an Azure File share made with the File REST protocol, files are addressable using the following URL format:

https://<storage account>.file.core.windows.net/<share>/<directory>/directories>/<file>



Azure Files:
Data Access Method

Azure Files offers two data access methods that you can use separately, or in combination with each other, to access your data:

- **Direct Cloud Access**
  - Azure File share can be mounted by Windows, macOS, and/or Linux.
- **Azure File Sync**
  - With Azure File Sync, shares can be replicated to Windows Servers on-premises or in Azure.
  - Users would access the file share through the Windows Server
  - Data may be replicated between multiple Windows Server endpoints.
  - Data tiered to Azure Files, but the Server does not have a full copy of the data.
  - Rather, data is seamlessly recalled when opened by your user.

Azure Table Storage

What is Azure Table Storage?

- You can use the Azure Table storage service to store partially structured data in tables.
- Within each storage account, you can create multiple tables, and each table can contain multiple entities.
- Because table storage does not mandate a schema, the entities in a single table do not need to have the same set of properties.

Example

- One Product entity might have a Size property, while another Product entity in the same table might have no Size property at all.
- Each property consists of a name and a value.

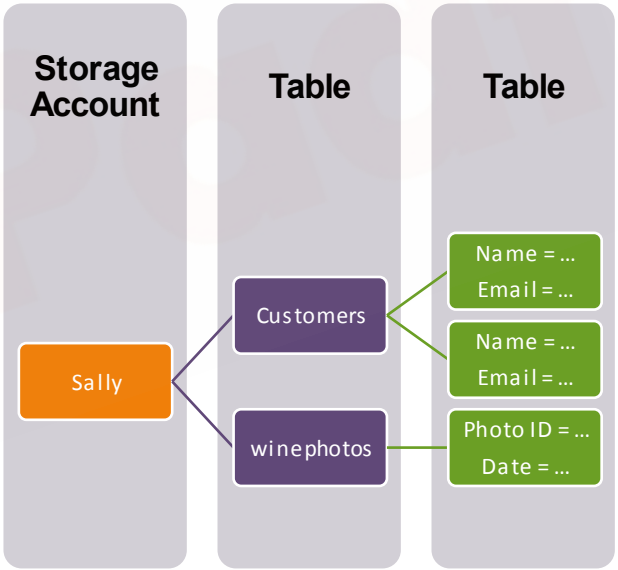
- Similar to blobs, applications can access each table through a URL.

Example:

- To access a table named "**mytable**" in a storage account named "**myaccount**", applications would use the: http://myaccount.table.core.windows.net/mytable

Azure Table: Components

- **Storage Account**
- **Table**
  - A table is a collection of entities.
  - The number of tables that a storage account can contain is limited only by the storage account capacity limit.
- **Table**
  - An entity is a set of properties, similar to a database row.
  - An entity can be up to 1MB in size.
- **Properties**
  - A property is a name-value pair.
  - Each entity also has three system properties that specify a partition key, a row key, and a timestamp.



Azure Table: Service

- The Table service uses a tabular format to store data.
- In table, each row of the table represents an entity, and the columns store the various properties of that entity.
- Every entity also has three designated properties: a partition key, a row key, and a timestamp.
- You can use the partition key to group similar entities based on their common characteristic, but with unique row key values.

Azure Queue Storage

What is Azure Queue Storage?

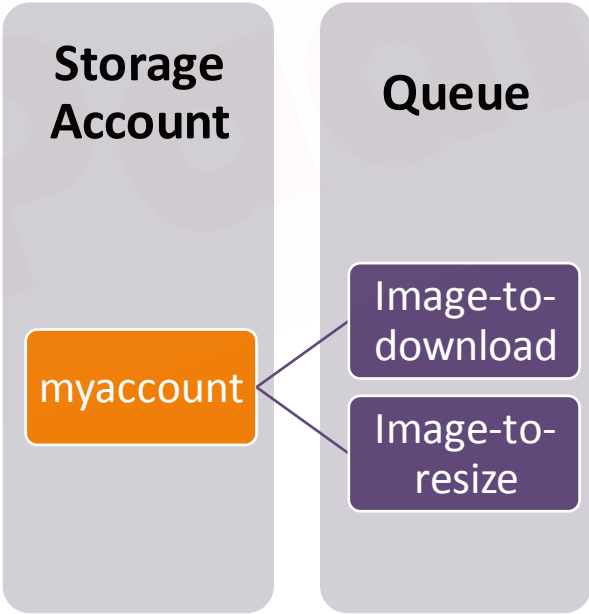
- The Azure Queue storage service provides temporary messaging store.
- Developers frequently use queues to facilitate reliable exchange of messages between individual components of multitier or distributed systems.
- These components add and remove messages from a queue by issuing commands over the HTTP / HTTPS protocols.
- Similar to other Azure storage service types, each queue is accessible from a URL.
- Example
  - To access a queue named "**myqueue**" in a storage account named "**myaccount**", applications would use:

    http://myaccount.queue.core.windows.net/myqueue
- You can create any number of queues in a storage account and any number of messages in each queue up to the 500 TB limit for all the data in the storage account.
- Each message can be up to 64 kilobytes (KB) in size.

Azure Queue Storage: Components

- **URL format**
  - Queues are addressable using the following URL format:

    http://<storage account>.queue.core.windows.net/<queue>
- **Storage account**
  - All access to Azure Storage is done through a storage account.
- **Queue**
  - A queue contains a set of messages.
  - All messages must be in a queue.
- **Message**
  - A message, in any format, of up to 64 KB.
  - The maximum time that a message can remain in the queue is seven days.



Hands-On

Hands-On

- Create storage account
- Create blob & container
- Upload & access data
- Configure security for data access

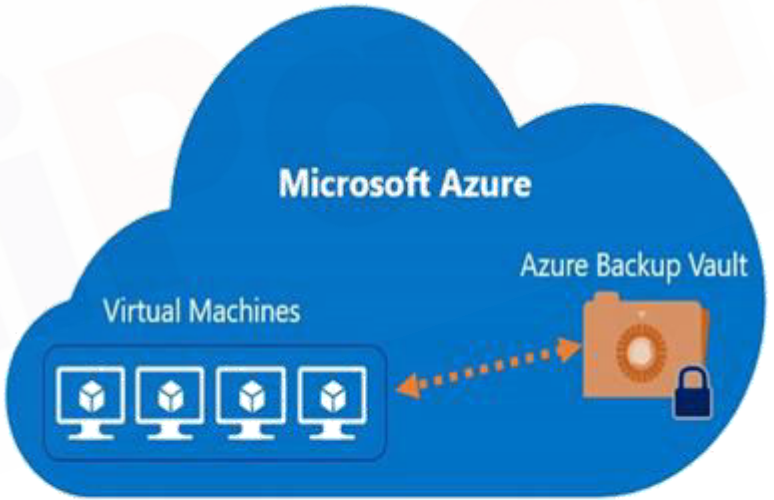
- Create file share
- Connect and mount on server & desktop

- Create table storage
- Update & query table

Azure Backup

What is Azure Backup?

- Azure Backup is the Azure-based service you can use to back up and restore your data in the cloud.
- Azure Backup replaces your existing on-premises solution with a cloud-based solution.
- Azure Backup offers multiple components that you download and deploy on the appropriate computer, server, or in the cloud.
- All Azure Backup components can be used to back up data to a Recovery Services vault in Azure.



Azure Backup: Benefit

Automatic storage management

- With Azure Backup, there is no cost for using on-premises storage devices.
- Azure Backup automatically allocates and manages backup storage, and it uses a pay-as-you-use model.

Multiple storage options

- Azure Backup offers two types of replication: locally redundant storage and geo-redundant storage.

Data encryption

- Data encryption allows for secure transmission and storage of your data in the public cloud.

Application-consistent backup

- Whether backing up a file server, virtual machine, or SQL database, you need to know that a recovery point has all required data to restore the backup copy.

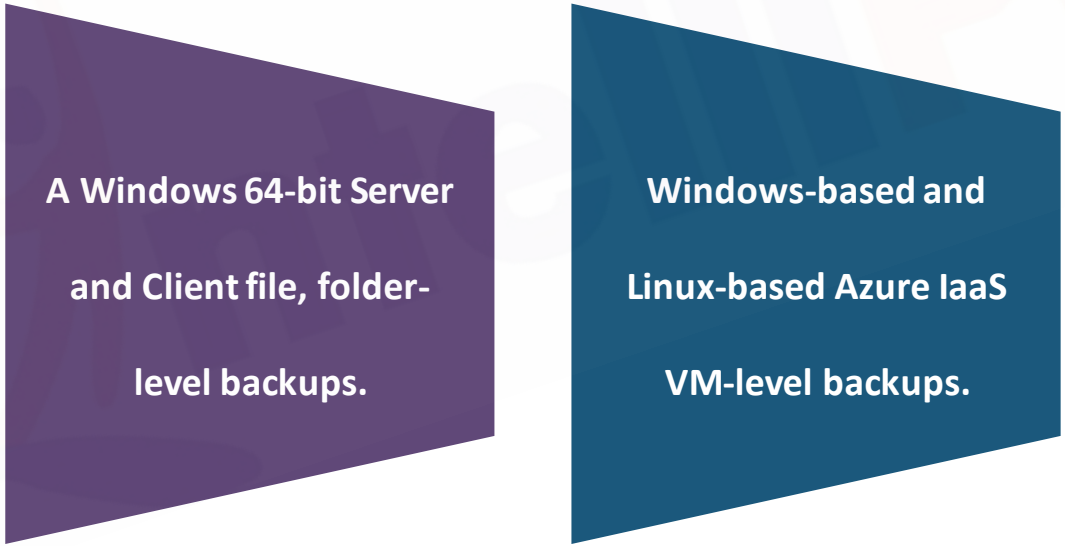
Long-term retention

- You can keep data in a vault for as long as you like.

Unlimited scaling & data transfer

Azure Backup: Overview

- The Azure Backup service uses Azure resources for short-term and long-term storage.
- The Azure Backup service includes:

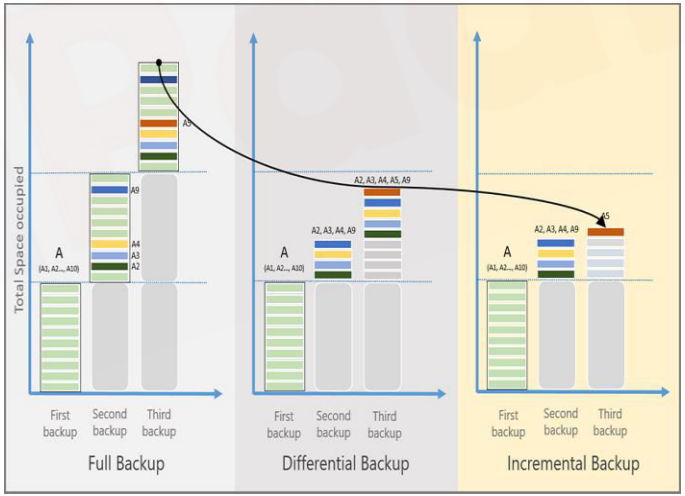


Azure Backup: Recovery Services Vault

- A vault is the virtual destination of backups.
- The vault should reside in an Azure region that is close to the physical location of the data, and in the case of Azure virtual machines, in the same region.
- An Azure subscription can host up to 25 vaults. Each vault can protect up to 50 computers.
- No limitation on the amount of data in the vault and no limitation on the maximum retention time of backed up content.
- There is a restriction on the size of each data source: about 54,000 GB for Windows 8/ 2012, and newer OS.
- All backups are encrypted at the source with a passphrase that the customer chooses and maintains.
- There are no additional charges for the traffic generated during backup, both ingress, into Azure and during restore, egress, out of Azure.

Azure Backup:
Backup Types

- Data source A is composed of 10 storage blocks A1-A10, which are backed up monthly.
- Blocks A2, A3, A4, and A9 change in the first month, and block A5 changes in the next month.
- With **Full Backup**, each backup copy contains the entire data source.
- **Differential backup** stores only the blocks that changed since the initial full backup. The changed blocks continue to be backed up until the next full backup happens.
- **Incremental Backup** store only the blocks of data that changed since the previous backup. With incremental backup, there is no need to take regular full backups.



Azure Backup:
Incremental Backup

Every Azure Backup component supports incremental backup regardless of the target storage.

Incremental backup ensures that backups are storage and time efficient, by transferring only those changes made since the last backup.

Implement Azure Backup

Configure Azure Backup Reports

- Azure Backup reports are supported for Azure virtual machine backup and file and folder backup to the cloud by using the Azure Recovery Services Agent.
- Reports for Azure SQL Database, Azure File Shares, Data Protection Manager, and Azure Backup server aren't supported at this time.
- You can view reports across vaults and subscriptions, if the same storage account is configured for each of the vaults. The storage account selected must be in the same region as the Recovery Services vault.
- The frequency of scheduled refresh for the reports is 24 hours in Power BI. You also can perform an ad-hoc refresh of the reports in Power BI. In this case, the latest data in the customer storage account is used to render reports.

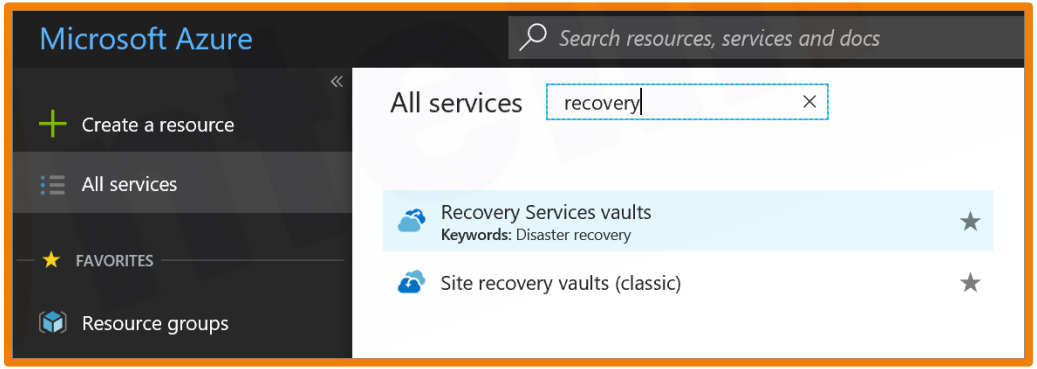
Prerequisites

- **Create an Azure storage account** to **configure** it for reports. This storage account is used to store **reports-related data**.
- **Create a Power BI account** to **view**, **customize**, and **create** your own reports by using the **Power BI portal**.
- Register the resource provider **Microsoft.insights**, if it's not registered already. Use the subscriptions for the storage account and the Recovery Services vault so that reporting data can flow to the storage account. To do this step, go to the Azure portal, select Subscription > Resource providers, and check for this provider to register it.

Implement Azure Backup:
Create a Storage Account

Follow these steps:

- If you already have a Recovery Services vault open, go to the next step. If you don't have a Recovery Services vault open, in the Azure portal, select All services.
- In the list of resources, enter Recovery Services.
- As you begin typing, the list filters based on your input. When you see Recovery Services vaults, select it.



- The list of Recovery Services vaults appears. From the list of Recovery Services vaults, select a vault.
- The selected vault dashboard opens.

Azure Backup: Security

- All backup traffic from your servers to the Recovery Services vault is encrypted using Advanced Encryption Standard 256.
- The backup data is sent over a secure HTTPS link.
- The backup data is also stored in the Recovery Services vault in encrypted form.
- Once you establish the Recovery Services vault, only you have access to the encryption key. Microsoft never maintains a copy of your encryption key, and does not have access to the key. If the key is misplaced, Microsoft cannot recover the backup data.
- Backing up Azure VMs requires setting up encryption *within* the virtual machine. Use BitLocker on Windows virtual machines and dm-crypt on Linux virtual machines.

Azure Backup:
Backup and Retention

- Azure Backup has a limit of 9999 recovery points, also known as backup copies or snapshots, per protected instance.
- For example, if you create a recovery point each day, then you can retain recovery points for 27 years before you run out.
- If you take a monthly recovery point, you can retain recovery points for 833 years before you run out.
- The Backup service does not set an expiration time limit on a recovery point.

Azure Backup: Pricing

- The size of the backed-up data determines the pricing.
- For virtual machines, the size of the allocated disk determines the data size.
- When backing-up files and folders, the size of the files and folders configured for backup determine the data size.
- When backing-up SQL Server, the size of the databases configured for backup determine the data size.
- You have the flexibility to choose between LRS GRS.
- Charges for storage are separate from the cost of Backup.

SIZE OF EACH INSTANCE	AZURE BACKUP PRICE PER MONTH
Instance < or = 50 GB	$5 + storage consumed
Instance is > 50 but < or = 500 GB	$10 + storage consumed
Instance > 500 GB	$10 for each 500 GB increment + storage consumed

*Pricing as on 1st January 2018

Hands-On

Hands-On

- ❑ Configure Azure backup
- ❑ Install agent on On-Premises server
- ❑ Configure agent on On-Premises server
- ❑ Take backup of On-Premises server
- ❑ Restore backup on On-Premises server

QUIZ

Quiz 1

Which one of them is the Object based storage in Azure?

A	Azure Queue Storage
B	Azure Data lake storage
C	Azure Storage explorer
D	Azure Blob storage

Answer 1

Which one of them is the Object based storage in Azure?

A	Azure Queue Storage
B	Azure Data lake storage
C	Azure Storage explorer
D	Azure Blob storage

Quiz 2

Limitless storage for data analytics?

A	Azure Archive Storage
B	Azure Blob storage
C	Azure Data lake storage
D	Azure Storage explorer

Answer 2

Limitless storage for data analytics?

A	Azure Archive Storage
B	Azure Blob storage
C	Azure Data lake storage
D	Azure Storage explorer

Quiz 3

Which one of them is true about Incremental Backup?

A	Incremental Backups achieve high storage and network efficiency by storing only the blocks that change since the previous backup.
B	Incremental Backups achieve high storage and network efficiency by storing only the blocks that change with the new backup.
C	Incremental Backups achieve high storage and network efficiency by storing the whole set of data with without its backup
D	Incremental Backups are used for backing up your increasing data

Answer 3

Which one of them is true about Incremental Backup?

A	Incremental Backups achieve high storage and network efficiency by storing only the blocks that change since the previous backup.
B	Incremental Backups achieve high storage and network efficiency by storing only the blocks that change with the new backup.
C	Incremental Backups achieve high storage and network efficiency by storing the whole set of data with without its backup
D	Incremental Backups are used for backing up your increasing data

Quiz 4

Purpose of queue storage?

A	Used for storing large number of messages which can be accessed from anywhere
B	Used for storing only small amount of data for better efficiency
C	Used for storing large data which can be accessed from the local machine only
D	All of the above

Answer 4

Purpose of queue storage?

A	Used for storing large number of messages which can be accessed from anywhere
B	Used for storing only small amount of data for better efficiency
C	Used for storing large data which can be accessed from the local machine only
D	All of the above

Quiz 5

IntelliPaat

Which one of them is Azure Activity Log?

A	Provides logs of azure used all across the globe
B	Provides insights into subscription-level events that have occurred in Azure
C	Gives you alerts on excessive usage of resources
D	Provision resources for you

Answer 5

Which one of them is Azure Activity Log?

A	Provides logs of azure used all across the globe
B	Provides insights into subscription-level events that have occurred in Azure
C	Gives you alerts on excessive usage of resources
D	Provision resources for you

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