ThreatModel for Azure Storage

Introduction

Read the blog: TBD

Content

This publication includes:

- overall data flow diagram of Azure Storage

- overview of the Mitre ATT&CK matrix for Azure Storage

- prioritized list of all threat scenarios

- list of all the control activities and testing procedures

- risk-based prioritized list of control implementation

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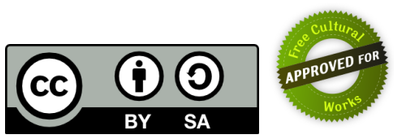

Source

The latest version of this work is hosted on GitHub.

Contact

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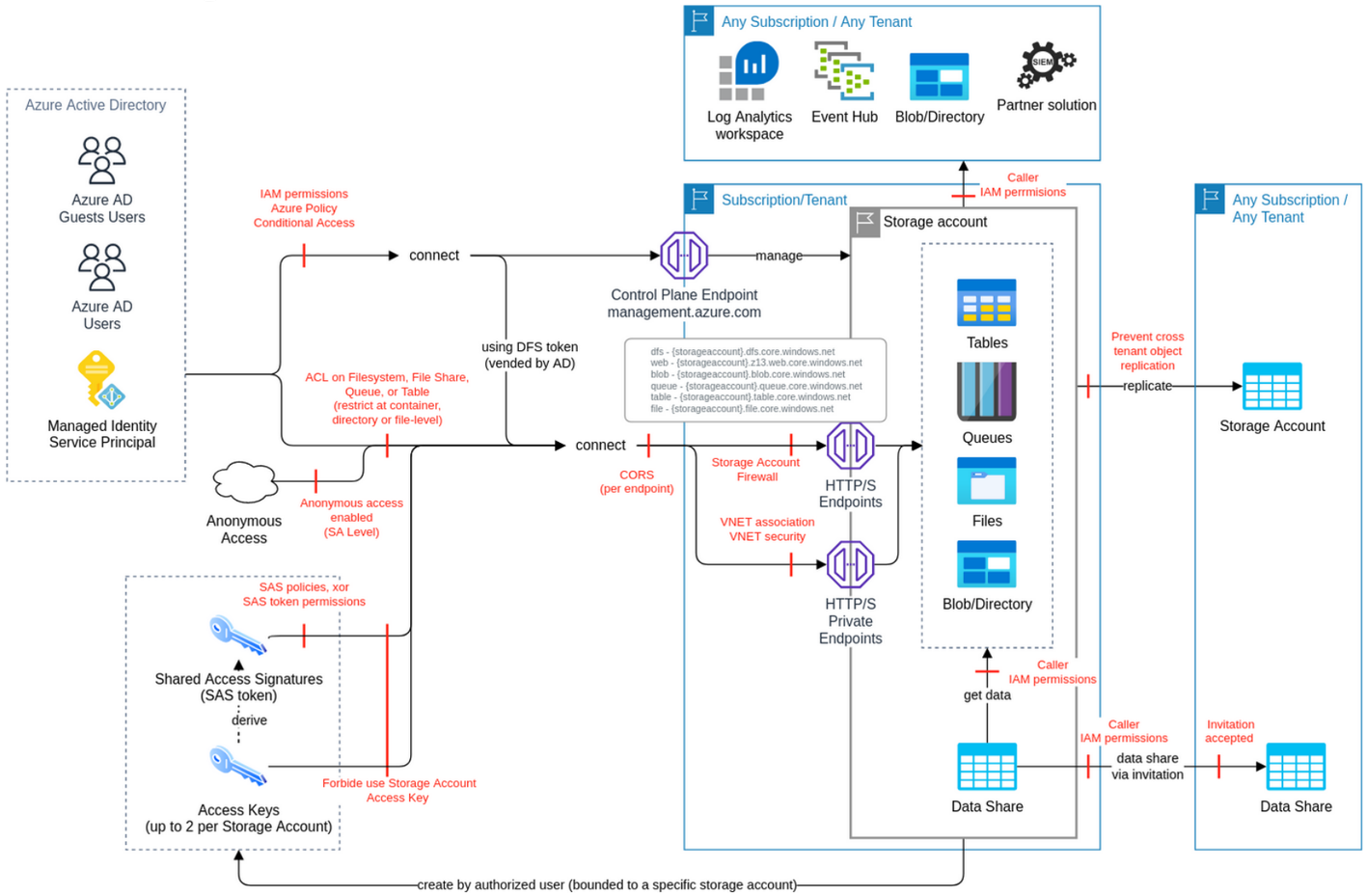
Azure Storage

Data Flow Diagram



Security Scorecard

Security in the Cloud	
Number of Actions*	164
Identity management	Azure IAM
Number of IAM permissions*	139
Resource-based access	DFS ACL, file share ACL, queue ACL, table ACL, storage account access keys, SAS tokens
Logging Coverage for APIs	100.0%
Number of Logging Event Names*	164
Network Filtering	VNET security, Storage Account Firewall
Encryption-at-rest	Yes
Encryption-in-transit	Yes

* See details in Appendixes

Mitre ATT&CK matrix for Azure Storage

Initial Access	Execution	Persistence	Privilege Escalation	Defense Evasion	Credential Access	Discovery	Lateral Movement	Collection	Exfiltration	Impact
		Infect with malware downstream processes [Storage.T12]	Privilege escalation by modifying file system ACL [Storage.T6]						Privilege escalation accessing storage access key [Storage.T1]	Block data access of a SAS token [Storage.T2]
		Distribute malicious files via file share [Storage.T20]	Privilege escalation by modifying file share ACL [Storage.T17]						Exfiltrate data using account key access or SAS token [Storage.T3]	Recursively delete DFS directories and their content [Storage.T7]
		Distribute malicious infected files via a reputed web address [Storage.T22]	Usage outdated protocols to access file shares [Storage.T21]						Use storage account name to steal data or distribute malicious data [Storage.T4]	Unauthorised modification of data [Storage.T8]
			Unauthorized data exposed by breaking CORS settings [Storage.T26]						Unauthorized data made public [Storage.T5]	Files encrypted by ransomware in DFS/blob [Storage.T9]
			Privilege escalation by modifying queue ACL [Storage.T27]						Exfiltrate data using diagnostic settings [Storage.T10]	Increase billing by file share overflow [Storage.T16]
			Privilege escalation by modifying table ACL [Storage.T28]						Man-in-the-middle attack via any storage account endpoint [Storage.T11]	Recursively delete directories and the content in the file share [Storage.T18]
									Unauthorised access to data via storage account replication [Storage.T13]	Files encrypted by ransomware in file shares [Storage.T19]
									Unauthorised access to data by direct access to the physical disk [Storage.T14]	Recursively delete data using blob storage lifecycle management [Storage.T25]
									Exfiltrate data using different access method [Storage.T15]	DDoS on endpoint [Storage.T29]
									Exfiltrate data using different service [Storage.T23]	Impacting queues messages integrity or complete data loss of sensitive data [Storage.T31]
									Exfiltrate data using blob inventory functionality [Storage.T24]	
									Unauthorized access to data using a rogue DFS endpoint [Storage.T30]	
									Unauthorized access to a sensitive message [Storage.T32]	

Feature Classes

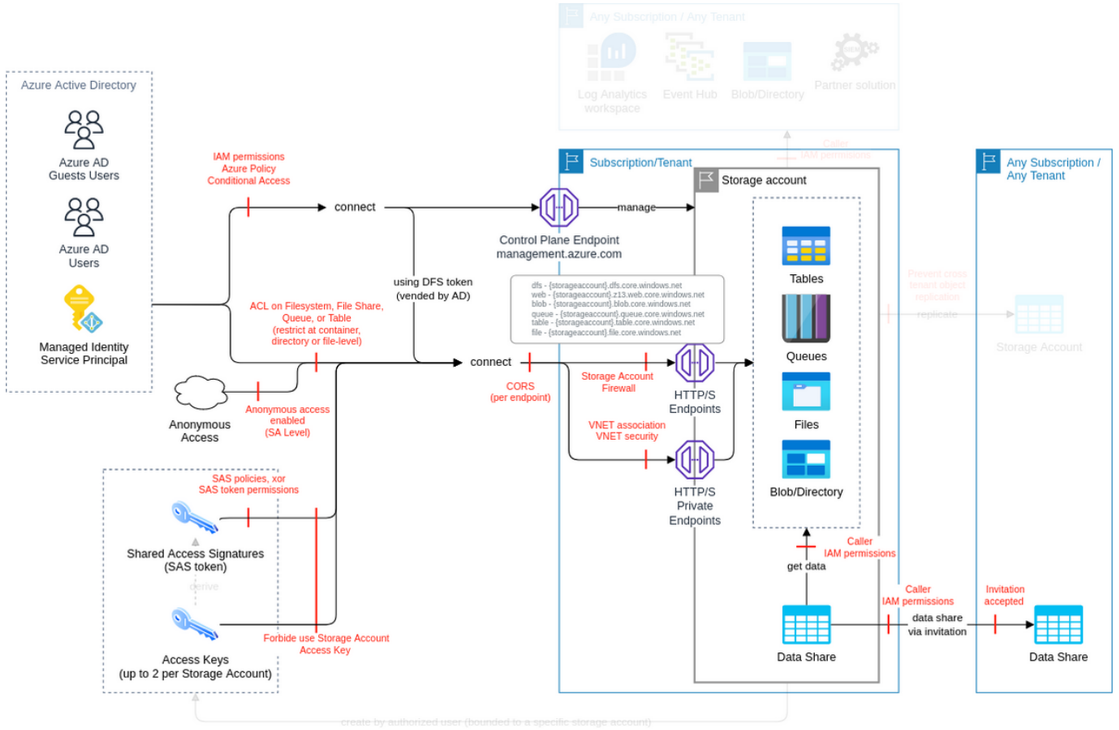
Azure Storage has the following feature classes and subclasses (i.e. dependent on the usage of its class) that can be activated, restricted, or blocked using Microsoft Azure Identity and Access Management.

Feature	Relation	Description
Storage account	class	Azure storage is Microsoft's cloud storage solution for modern data storage scenarios. Azure storage offers a massively scalable object store for data objects, a file system service for the cloud, a messaging store for reliable messaging, and a NoSQL store.
Key access feature	subclass of Storage account	When you create a storage account, Azure generates two 512-bit storage account access keys. These keys can be used to authorise access to data in your storage account via Shared Key authorization. Microsoft recommends that you use Azure Key Vault to manage your access keys, and that you regularly rotate and regenerate your keys.
File shares	subclass of Storage account	Azure Files offers fully managed file shares in the cloud that are accessible via the industry standard Server Message Block (SMB) protocol or Network File System (NFS) protocol.
Monitoring	subclass of Storage account	Storage insights provides comprehensive monitoring of your Azure storage accounts by delivering a unified view of your Azure storage services performance, capacity, and availability.
Queues	subclass of Storage account	Azure queue storage is a service for storing large numbers of messages. Access messages via HTTP/S calls.
Replication	subclass of Storage account	Azure storage always stores multiple copies of data. It protects from planned and unplanned events, including transient hardware failures, network or power outages, and massive natural disasters. Redundancy ensures that your storage account meets its availability and durability targets even in the face of failures.
Tables	subclass of Storage account	The most economic table style storage over the word to store petabytes of semi-structured data and keep costs down.
Blob storage, containers, data Lake storage Gen2	subclass of Storage account	Data Lake storage Gen2 is the storage for big data analysis based on Azure blob storage.
Blob inventory	subclass of Blob storage, containers, data Lake storage Gen2	The Azure storage blob inventory feature provides an overview of your containers, blobs, snapshots, and blob versions within a storage account. Use the inventory report to understand various attributes of blobs and containers such as your total data size, age, encryption status, immutability policy, or legal hold.
Blob lifecycle	subclass of Blob storage, containers, data Lake storage Gen2	Azure blob storage lifecycle management offers a rich, rule-based policy which you can use to transition your data to the best access tier and to expire data at the end of its lifecycle.

Storage account *(class, FC1)*

Azure storage is Microsoft's cloud storage solution for modern data storage scenarios. Azure storage offers a massively scalable object store for data objects, a file system service for the cloud, a messaging store for reliable messaging, and a NoSQL store.

Data Flow Diagram (DFD)



Actions and IAM Permissions to deny the feature

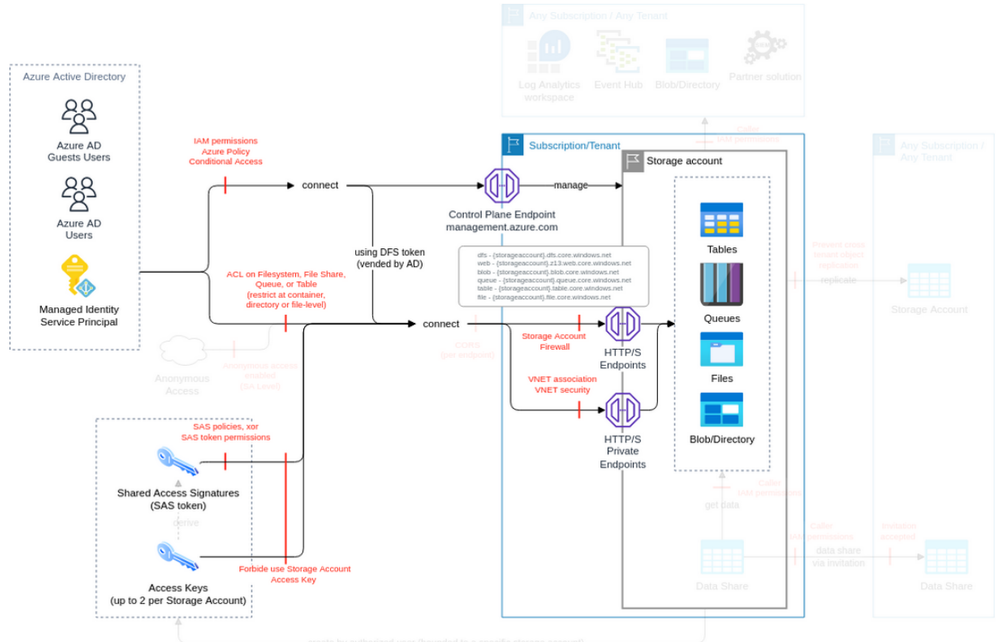
Action	IAM Permission
Creates a storage account with the specified parameters, updates the properties or tags, or adds a custom domain for the specified storage account.	Microsoft.Storage/storageAccounts/write
Manage storage account migration to enable hierarchical namespace.	Microsoft.Storage/storageAccounts/accountMigrations/write

Threat List

Name	CVSS
Man-in-the-middle attack via any storage account endpoint	High (7.1)
DDoS on endpoint	Medium (5.9)
Use storage account name to steal data or distribute malicious data	Medium (5.2)
Exfiltrate data using different service	Medium (4.9)
Unauthorized data exposed by breaking CORS settings	Medium (4.3)
Unauthorised access to data by direct access to the physical disk	Medium (4.2)

Man-in-the-middle attack via any storage account endpoint

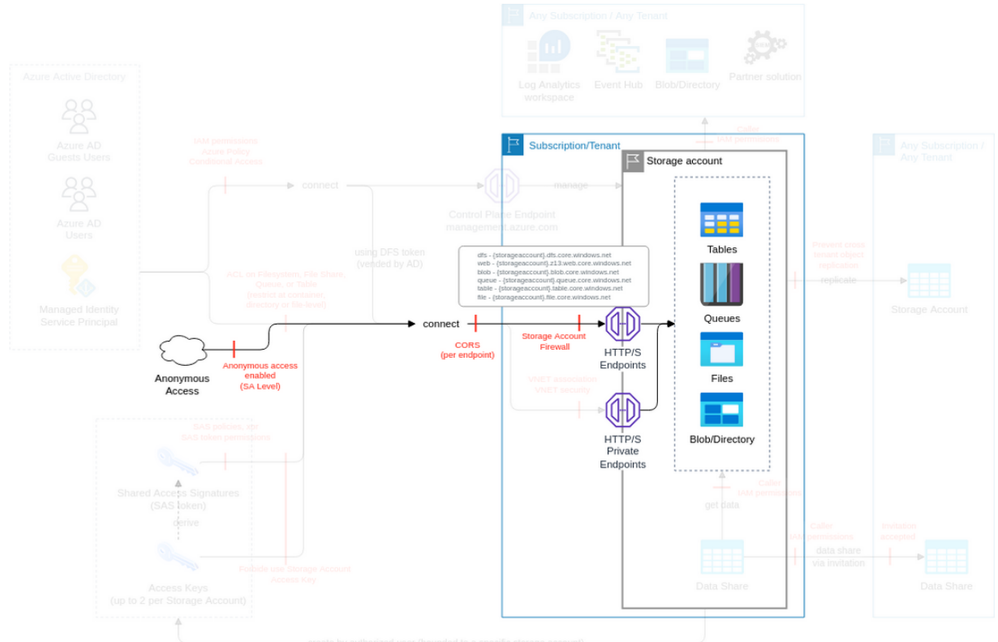
Threat Id	Storage.T11
Name	Man-in-the-middle attack via any storage account endpoint
Description	Storage account endpoints support HTTP/S. An attacker can intercept or modify the traffic via man-in-the-middle attack (e.g. with fake certificate to get and modify data in transit via endpoints).
Goal	Data theft
MITRE ATT&CK®	TA0010
CVSS	High (7.1)
IAM Access	{}



Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Enforce encryption-in-transit Maintain a list of authorized encryption in transit methods with desired assignment to storage accounts. Ideally minimum TLS 1.2. Ensure authorized encryption in transit methods with desired assignment is set for authorized storage accounts. Ensure storage accounts have authorized encryption in transit methods configured (e.g. using Azure Policy in deny mode). Monitor the creation/update usage encryption in transit methods with desired assignment is set for authorized storage accounts (e.g. using activity logs on properties.supportsHttpsTrafficOnly scope "supportsHttpsTrafficOnly").	Very High	2	1	1
Block access to the endpoints Maintain a list of IPs authorized to access each storage account. Ensure traffic is denied from all networks including trusted services, logging and metrics read access, and allow traffic only from authorized list (ref).	High	2	-	-
Connect via private endpoint Maintain a list of authorized VNETs for the blob, file shares, queues, tables, DFS access via private endpoint. Ensure only authorized VNET are configured for the blob, file shares, queues, tables, DFS. Prevent the use of unauthorized VNETs by the storage account (e.g. by using Azure Policy).	High	2	1	-

DDoS on endpoint

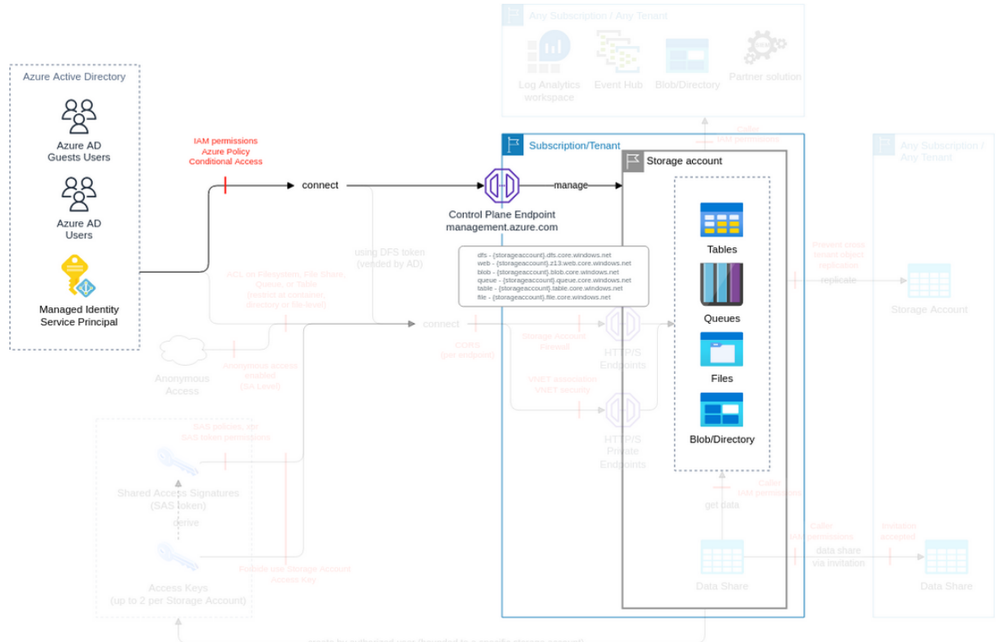
Threat Id	Storage.T29
Name	DDoS on endpoint
Description	An attacker can overload a public endpoint by a DDoS attack. If your application approaches or exceeds any of the scalability targets, it may encounter increased transaction latencies or throttling with 500 errors.
Goal	Disruption of Service
MITRE ATT&CK®	TA0040
CVSS	Medium (5.9)
IAM Access	{}



Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Block access to the endpoints Maintain a list of IPs authorized to access each storage account. Ensure traffic is denied from all networks including trusted services, logging and metrics read access, and allow traffic only from authorized list (ref). Prevent access from unauthorized IPs, by allowing only authorized IP using Azure Storage Firewall.	High	2	1	-
Connect via private endpoint Maintain a list of authorized VNETs for the blob, file shares, queues, tables, DFS access via private endpoint. Ensure only authorized VNET are configured for the blob, file shares, queues, tables, DFS. Prevent the use of unauthorized VNETs by the storage account (e.g. by using Azure Policy).	High	2	1	-

Use storage account name to steal data or distribute malicious data

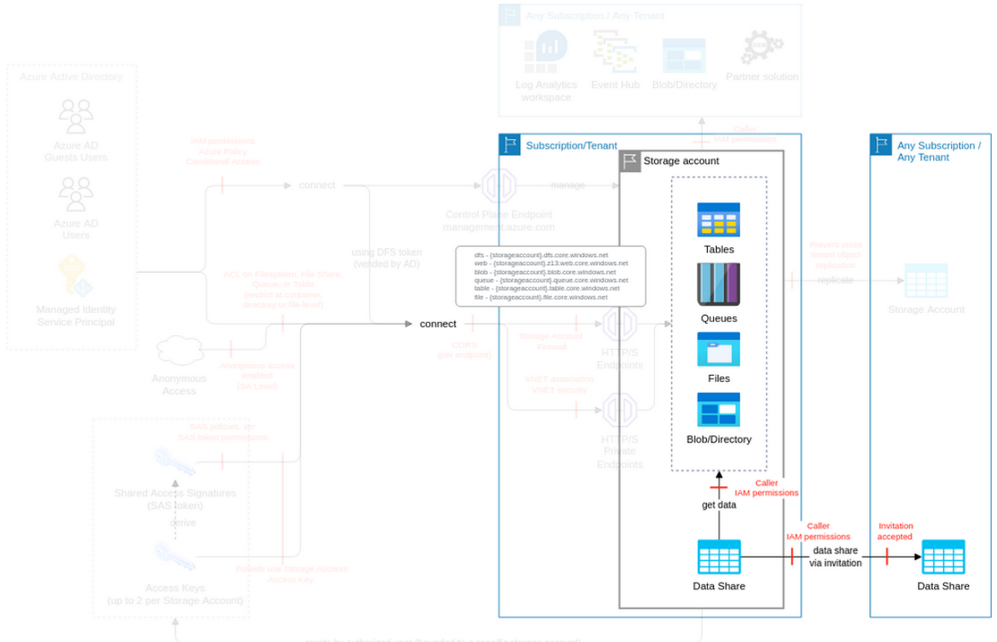
Threat Id	Storage.T4
Name	Use storage account name to steal data or distribute malicious data
Description	Azure storage account names are globally unique. An attacker can take over an old account name, or delete an existing one, and entangle any third party to use their account to steal or distribute malicious data.
Goal	Data theft
MITRE ATT&CK®	TA0010
CVSS	Medium (5.2)
IAM Access	{ "OPTIONAL": "Microsoft.Storage/storageAccounts/delete" }



Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Limit the access to the IAM actions required to perform attacks using Azure IAM, following the IAM Operating Model and using the Azure IAM ThreatModel.	Very High	1	-	-

Exfiltrate data using different service

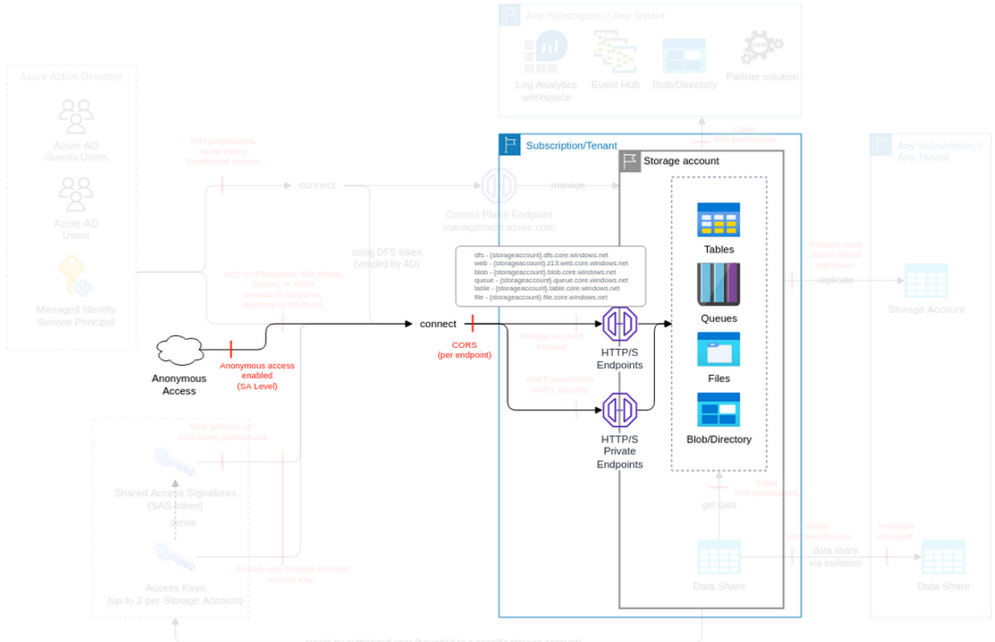
Threat Id	Storage.T23
Name	Exfiltrate data using different service
Description	An attacker can exfiltrate data using different services (e.g. Azure data share, Logic App). Moreover these data can be stored in different subscriptions/tenants.
Goal	Data theft
MITRE ATT&CK®	TA0010
CVSS	Medium (4.9)
IAM Access	{ "AND": ["Microsoft.Storage/storageAccounts/write", "Microsoft.Authorization/role assignments/write"] }



Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Limit the access to the IAM actions required to perform attacks using Azure IAM, following the IAM Operating Model and using the Azure IAM ThreatModel.	Very High	1	-	-

Unauthorized data exposed by breaking CORS settings

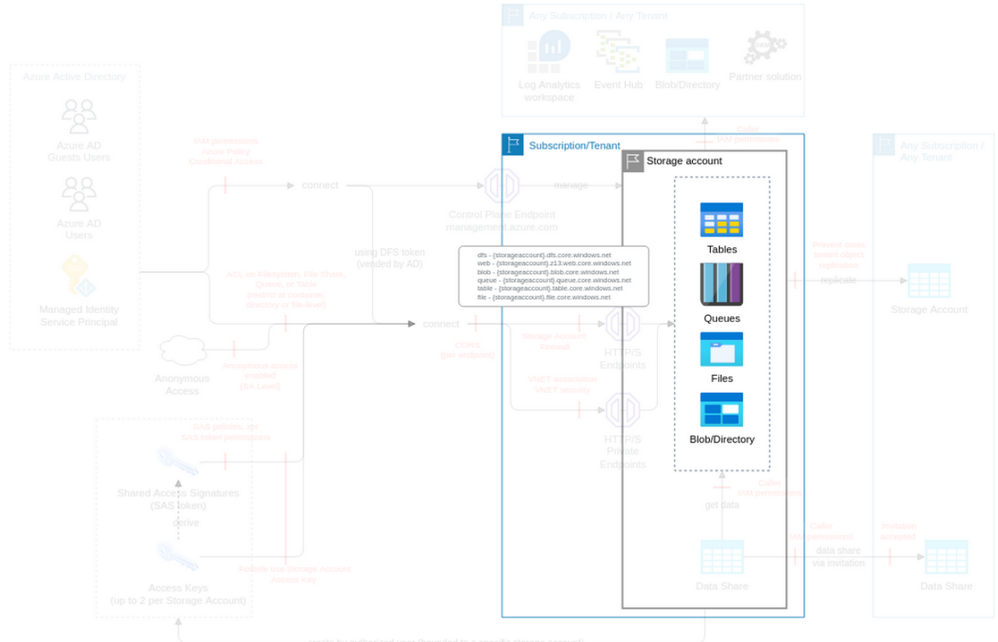
Threat Id	Storage.T26
Name	Unauthorized data exposed by breaking CORS settings
Description	CORS is an HTTP feature that enables a web application running under one domain to access resources in another domain. An attacker using the CORS misconfiguration can gain privileged access via origin reflection, enticing a user to access a page with a malicious script, returning sensitive data.
Goal	Launch another attack
MITRE ATT&CK®	TA0004
CVSS	Medium (4.3)
IAM Access	{ "UNIQUE": "Microsoft.Storage/storageAccounts/write" }



Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Govern Cross-Origin resource sharing Maintain a list of authorized CORS per endpoint trusted origins and corresponding settings. Ensure only authorized storage accounts have CORS trusted origins and corresponding settings configured. Prevent unauthorized storage accounts to use CORS trusted origins and corresponding settings (e.g. using Azure Policy in deny mode).	Very Low	2	1	-

Unauthorised access to data by direct access to the physical disk

Threat Id	Storage.T14
Name	Unauthorised access to data by direct access to the physical disk
Description	Azure is operating the storage physical disks. An attacker (i.e. an Azure insider) can get access to data stored on the device.
Goal	Data theft
MITRE ATT&CK®	TA0010
CVSS	Medium (4.2)
IAM Access	{}

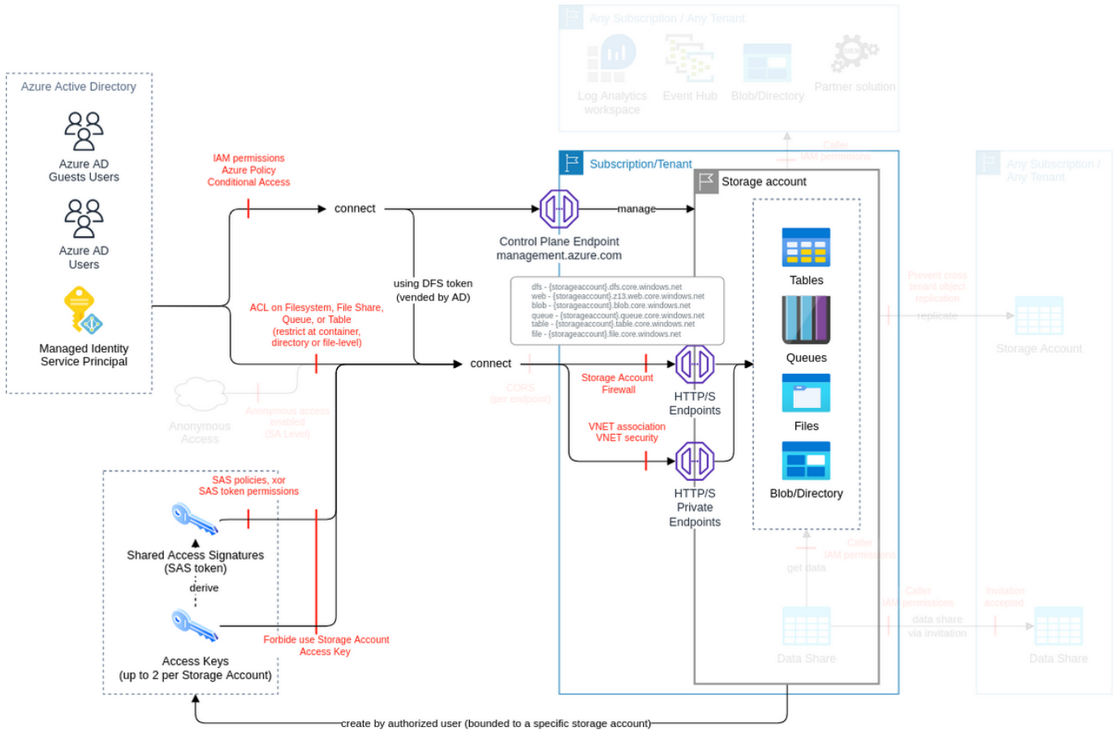


Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Enforce encryption-at-rest Maintain a list of authorized keys for Azure storage encryption with desired assignment and rotation policy. Ensure authorized keys for Azure storage encryption with desired assignment and rotation policy is set for authorized storage accounts. Ensure only authorized keys for Azure storage encryption with desired assignment and rotation policy are assigned (e.g. using Azure Policy in deny mode). Monitor the creation/update and usage keys for Azure storage encryption with desired assignment and rotation policy assignment (e.g. using monitoring logs on authentication type in AccountKey).	High	2	1	1
Apply cloud adoption, strategy, and governance Maintain a list of authorized Azure storage region options. Ensure authorized Azure storage region is set for authorized storage accounts. Ensure only authorized Azure storage region is set for authorized storage accounts (e.g. using Azure Policy in deny mode).	Low	2	1	-
Protect primary data against loss Maintain a list of authorized Azure storage redundancy options. Ensure authorized Azure storage redundancy is set for authorized storage accounts. Ensure only authorized Azure storage redundancy is set for authorized storage accounts (e.g. using Azure Policy in deny mode).	Low	2	1	-

Key access feature *(subclass of Storage account, FC7)*

When you create a storage account, Azure generates two 512-bit storage account access keys. These keys can be used to authorise access to data in your storage account via Shared Key authorization. Microsoft recommends that you use Azure Key Vault to manage your access keys, and that you regularly rotate and regenerate your keys.

Data Flow Diagram (DFD)



Actions and IAM Permissions to deny the feature

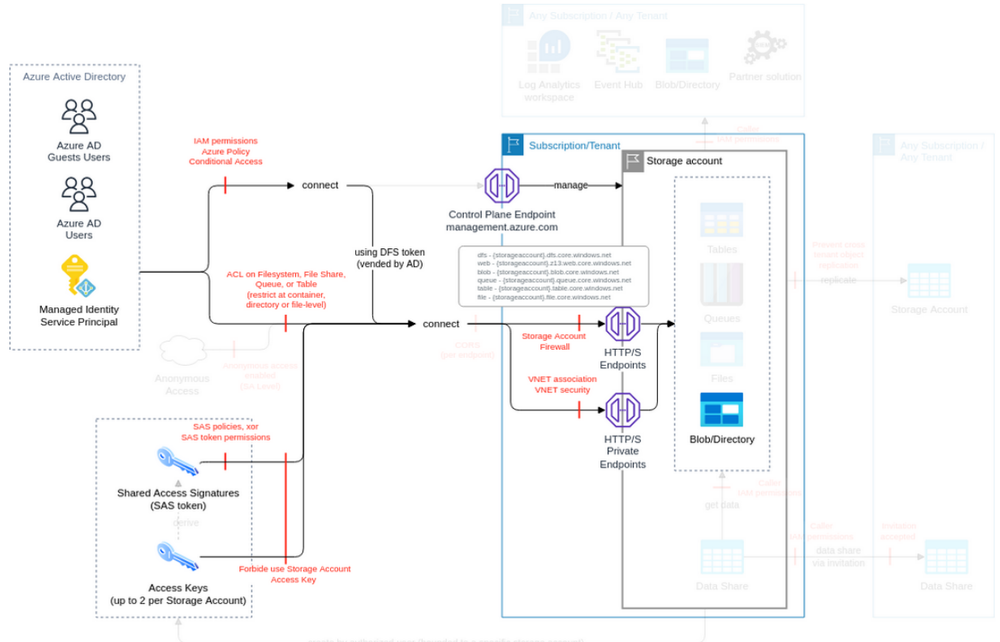
Action	IAM Permission
Returns the access keys for the specified storage account.	Microsoft.Storage/storageAccounts/listkeys/action
Regenerates the access keys for the specified storage account.	Microsoft.Storage/storageAccounts/regeneratekey/action

Threat List

Name	CVSS
Exfiltrate data using account key access or SAS token	High (8.1)
Privilege escalation accessing storage access key	Medium (6.5)
Block data access of a SAS token	Medium (4.9)

Exfiltrate data using account key access or SAS token

Threat Id	Storage.T3
Name	Exfiltrate data using account key access or SAS token
Description	Storage access keys have unrestricted access to the storage account they are coming from; SAS token can give access to a blob, directory, or file. An attacker can use a stolen storage account access key or SAS tokens to access confidential data, or modify data maliciously.
Goal	Data theft
MITRE ATT&CK®	TA0010
CVSS	High (8.1)
IAM Access	{}

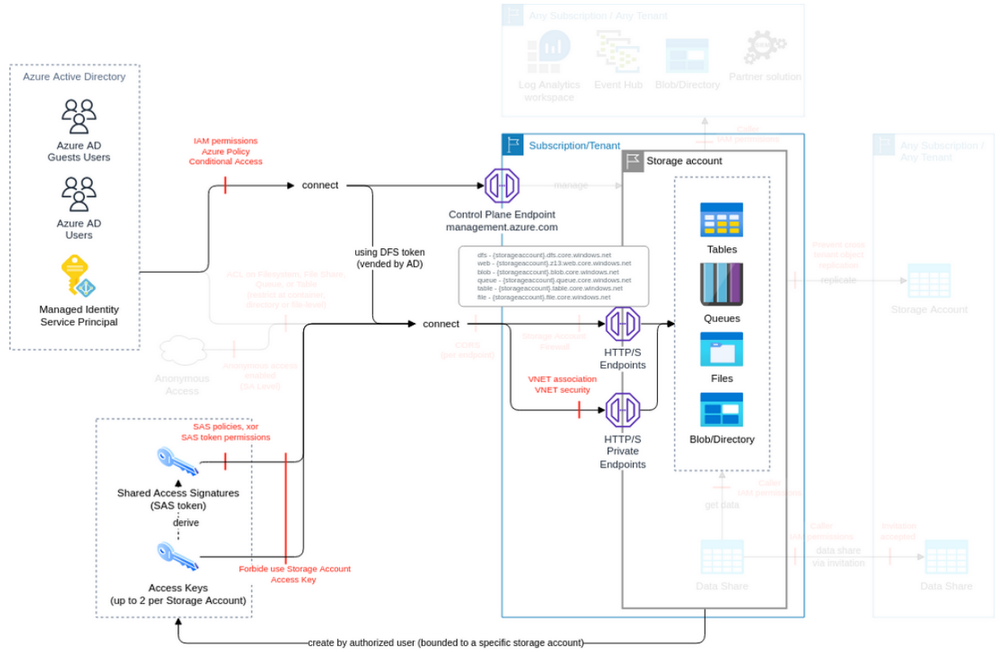


Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Managed Identity is the preferred method for accessing data Lake storage Gen2 from parent services. Integrate the access to blob, file shares, queues, tables and DFS via SAS token in the IAM Operating Model, ideally prioritising AD as preferred method. Block the usage of storage account access key, whenever possible. Maintain a revocation plan for any SAS or storage account access keys that you issue to clients based on requirements. If a SAS is compromised, you need to revoke that SAS as soon as possible. To revoke a user delegation SAS, revoke the user delegation key to quickly invalidate all signatures associated with that key. To revoke a service SAS that is associated with a stored access policy, you can delete the stored access policy, rename the policy, or change its expiry time to a time that is in the past (ref). Ensure the revocation plan is in place for any SAS or storage account access key.	Very High	3	1	-
Block access to the endpoints Maintain a list of IPs authorized to access each storage account. Ensure traffic is denied from all networks including trusted services, logging and metrics read access, and allow traffic only from authorized list (ref).	High	2	-	-
Connect via private endpoint Maintain a list of authorized VNETs for the blob, file shares, queues, tables, DFS access via private endpoint. Ensure only authorized VNET are configured for the blob, file shares, queues, tables, DFS.	High	2	1	-

Prevent the use of unauthorized VNETs by the storage account (e.g. by using Azure Policy).				
Identify and ensure the protection all storage accounts hosting your objects Maintain a list of authorized IPs to use SAS tokens, and their authorized time window. Ensure SAS tokens allow only authorized IPs, using the sourceIP field and enforcing HTTPS.	Medium	2	-	-
Enable storage accounts monitoring & notifications Define a diagnostic settings design for storage accounts including destination (tenant/subscription), categories (ideally all) and rotation, based on requirement. Resource logs are not collected by default. You must create a diagnostic setting for each Azure resource to send its resource logs to a Log Analytics workspace to use with Azure Monitor Logs, Azure Event Hubs to forward outside of Azure, or to Azure storage for archiving. Ensure diagnostic settings are configured properly to the architecture design. Ensure storage accounts have diagnostic settings configured according to the design.	Low	2	1	-
Enable soft-delete on containers, blobs, and file shares Ensure storage accounts have Azure Defender for Storage account enabled" with "Ensure storage accounts have Azure Defender for storage account enabled Prevent the creation of storage accounts without Azure Defender for storage account option (e.g. by using an Azure Policy "Microsoft.storage/storageaccounts/deleteRetentionPolicy" in deny mode). Ensure storage accounts have Azure Defender enabled Prevent the creation of storage accounts without Azure Defender (e.g. by using an Azure Policy in deny mode).	Very Low	2	2	-

Privilege escalation accessing storage access key

Threat Id	Storage.T1
Name	Privilege escalation accessing storage access key
Description	Storage accounts can have up to 2 access keys with unrestricted permissions on this storage account. An attacker can generate a new access key or use an existing key to gain unrestricted access.
Goal	Data theft
MITRE ATT&CK®	TA0010
CVSS	Medium (6.5)
IAM Access	{ "OR": ["Microsoft.Storage/storageAccounts/listkeys/action", "Microsoft.Storage/storageAccounts/regeneratekey/action", "Microsoft.Storage/storageAccounts/rotateKey/action", "Microsoft.Storage/storageAccounts/revokeUserDelegationKeys/action", "Microsoft.Storage/storageAccounts/localusers/listKeys/action", "Microsoft.Storage/storageAccounts/blobServices/generateUserDelegationKey/action"] }

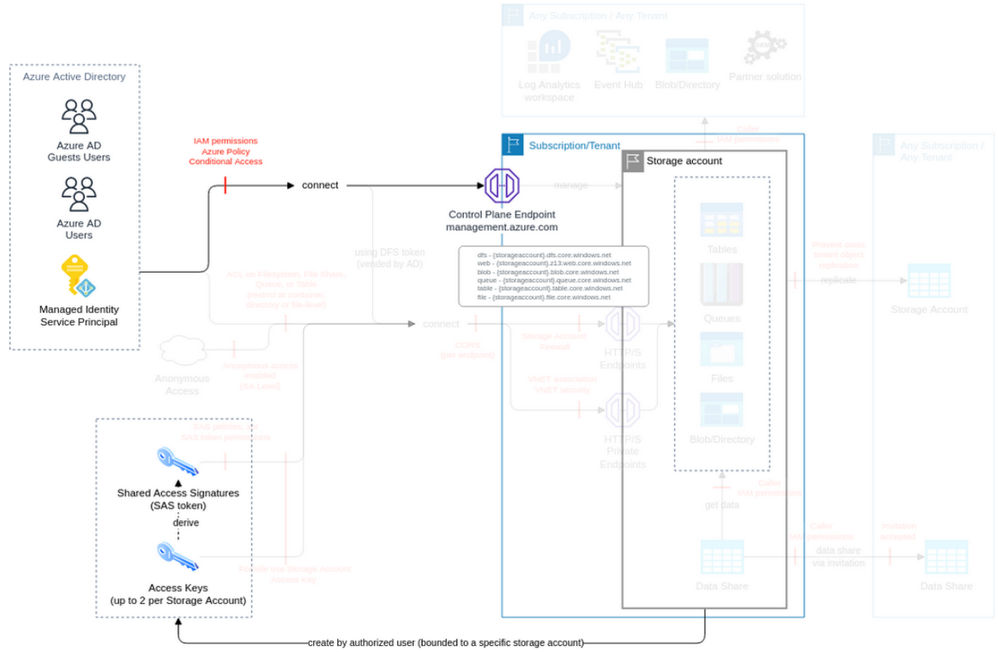


Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Limit the access to the IAM actions required to perform attacks using Azure IAM, following the IAM Operating Model and using the Azure IAM ThreatModel. Ensure only authorized Groups are used in ACLs for data Lake storage Gen2. Use name convention for Groups adding Suffix R/RW and Entity to be used. Integrate the access to blob, file shares, queues, tables and DFS via SAS token in the IAM Operating Model, ideally prioritising AD as preferred method. Block the usage of storage account access key, whenever possible. Maintain a revocation plan for any SAS or storage account access keys that you issue to clients based on requirements. If a SAS is compromised, you need to revoke that SAS as soon as possible. To revoke a user delegation SAS, revoke the user delegation key to quickly invalidate all signatures associated with that key. To revoke a service SAS that is associated with a stored access policy, you can delete the stored access policy, rename the policy, or change its expiry time to a time that is in the past (ref). Ensure the revocation plan is in place for any SAS or storage account access key.	Very High	5	1	-
Identify and ensure the protection all storage accounts hosting your objects Ensure SAS tokens allow only authorized IPs, using the sourceIP field and enforcing HTTPS.	Medium	1	-	-
Enable storage accounts monitoring & notifications	Low	2	1	-

Define a diagnostic settings design for storage accounts including destination (tenant/subscription), categories (ideally all) and rotation, based on requirement. Resource logs are not collected by default. You must create a diagnostic setting for each Azure resource to send its resource logs to a Log Analytics workspace to use with Azure Monitor Logs, Azure Event Hubs to forward outside of Azure, or to Azure storage for archiving. Ensure diagnostic settings are configured properly to the architecture design. Ensure storage accounts have diagnostic settings configured according to the design.				

Block data access of a SAS token

Threat Id	Storage.T2
Name	Block data access of a SAS token
Description	SAS tokens are derived from an access key. Functionality is typically used by non-Azure applications to access data in a storage account. An attacker can rotate, or regenerate an access key to invalidate its SAS tokens to block data access to any applications using SAS tokens derived from this access key.
Goal	Disruption of Service
MITRE ATT&CK®	TA0040
CVSS	Medium (4.9)
IAM Access	{ "OR": ["Microsoft.Storage/storageAccounts/regeneratekey/action", "Microsoft.Storage/storageAccounts/rotateKey/action", "Microsoft.Storage/storageAccounts/revokeUserDelegationKeys/action"] }



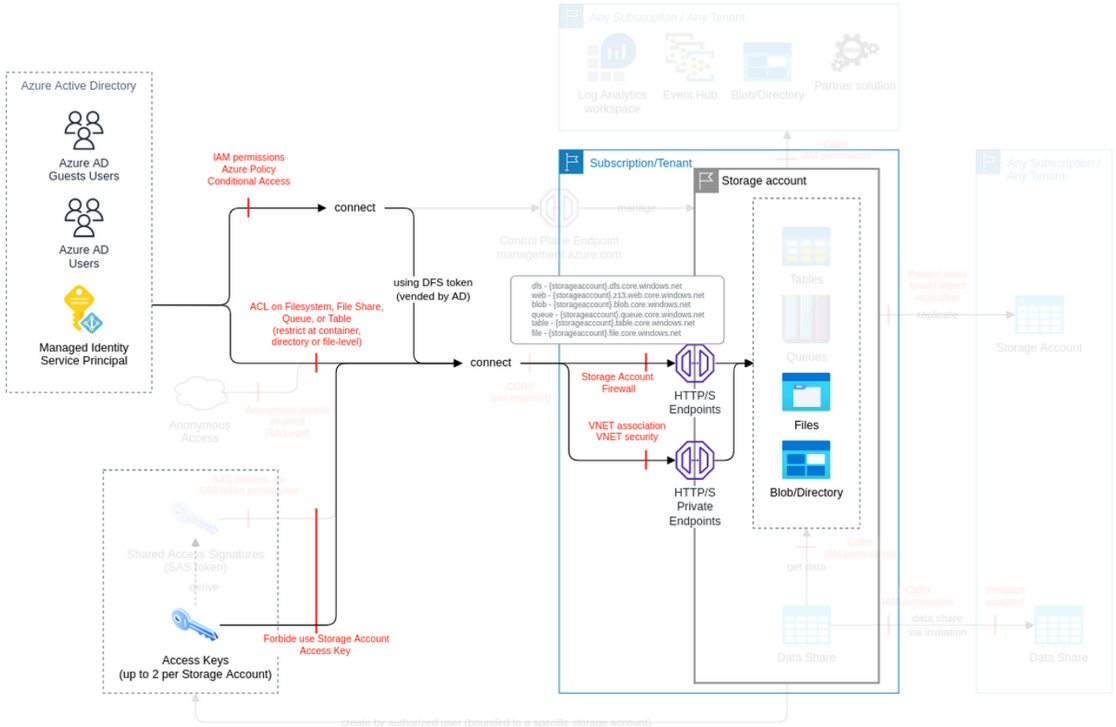
Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Limit the access to the IAM actions required to perform attacks using Azure IAM, following the IAM Operating Model and using the Azure IAM ThreatModel. Ensure only authorized Groups are used in ACLs for data Lake storage Gen2. Use name convention for Groups adding Suffix R/RW and Entity to be used. Managed Identity is the preferred method for accessing data Lake storage Gen2 from parent services. Block the usage of storage account access key, whenever possible. Maintain a revocation plan for any SAS or storage account access keys that you issue to clients based on requirements. If a SAS is compromised, you need to revoke that SAS as soon as possible. To revoke a user delegation SAS, revoke the user delegation key to quickly invalidate all signatures associated with that key. To revoke a service SAS that is associated with a stored access policy, you can delete the stored access policy, rename the policy, or change its expiry time to a time that is in the past (ref). Ensure the revocation plan is in place for any SAS or storage account access key.	Very High	6	1	-
Block access to the endpoints Maintain a list of IPs authorized to access each storage account. Ensure traffic is denied from all networks including trusted services, logging and metrics read access, and allow traffic only from authorized list (ref). Prevent access from unauthorized IPs, by allowing only authorized IP using Azure Storage Firewall.	High	2	1	-

Connect via private endpoint Maintain a list of authorized VNETs for the blob, file shares, queues, tables, DFS access via private endpoint. Ensure only authorized VNET are configured for the blob, file shares, queues, tables, DFS. Prevent the use of unauthorized VNETs by the storage account (e.g. by using Azure Policy).	High	2	1	-
Enable soft-delete on containers, blobs, and file shares Ensure storage accounts have Azure Defender for Storage account enabled" with "Ensure storage accounts have Azure Defender for storage account enabled Prevent the creation of storage accounts without Azure Defender for storage account option (e.g. by using an Azure Policy "Microsoft.storage/storageaccounts/deleteRetentionPolicy" in deny mode). Ensure storage accounts have Azure Defender enabled Prevent the creation of storage accounts without Azure Defender (e.g. by using an Azure Policy in deny mode).	Very Low	2	2	-

File shares *(subclass of Storage account, FC3)*

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

Data Flow Diagram (DFD)



Actions and IAM Permissions to deny the feature

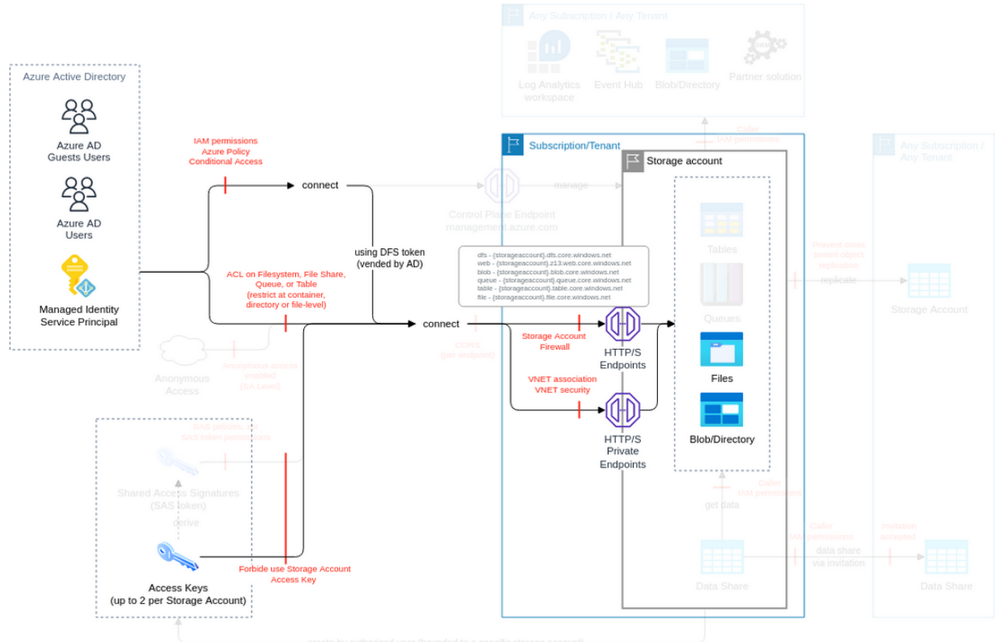
Action	IAM Permission
Create or update file share	Microsoft.Storage/storageAccounts/fileServices/shares/write

Threat List

Name	CVSS
Exfiltrate data using different access method	High (7.3)
Usage outdated protocols to access file shares	High (7.1)
Privilege escalation by modifying file share ACL	Medium (6.2)
Distribute malicious files via file share	Medium (4.9)
Recursively delete directories and the content in the file share	Medium (4.5)
Files encrypted by ransomware in file shares	Medium (4.5)
Increase billing by file share overflow	Low (3.5)

Exfiltrate data using different access method

Threat Id	Storage.T15
Name	Exfiltrate data using different access method
Description	Data stored on file share using SMB protocol can be accessible using HTTP/S protocol. An attacker can exfiltrate data using a different method of access (via blob access or static website endpoint) or an attacker can create an unauthorized DFS endpoint to gain access to the data in the blob.
Goal	Data theft
MITRE ATT&CK®	TA0010
CVSS	High (7.3)
IAM Access	{ "OR": ["Microsoft.Storage/storageAccounts/fileServices/fileshares/files/read", { "AND": ["Microsoft.Storage/storageAccounts/blobServices/containers/blobs/write", "Microsoft.Storage/storageAccounts/blobServices/containers/write"] }] }

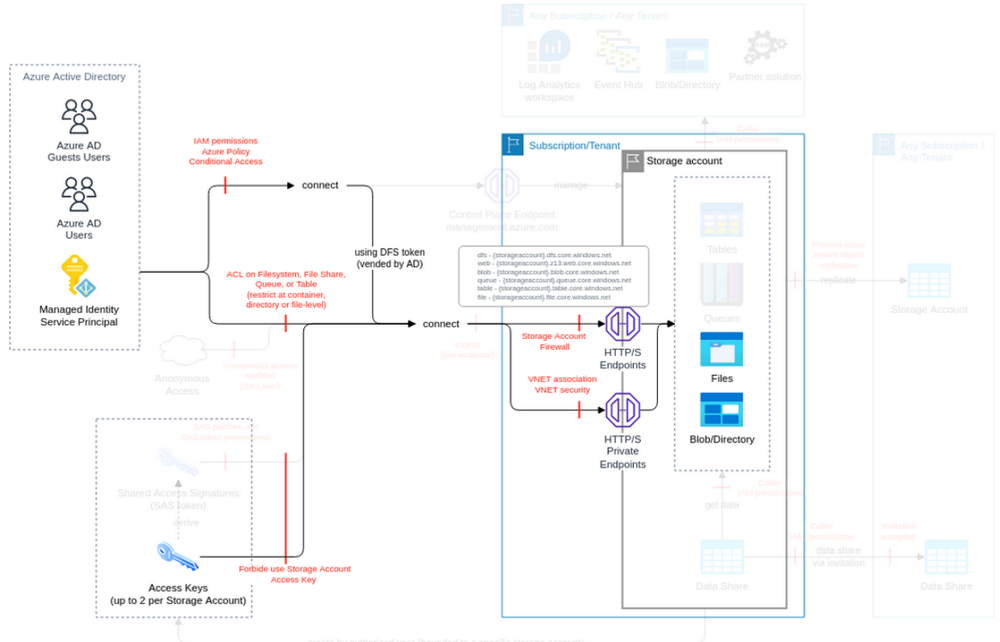


Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Block access to the endpoints Maintain a list of IPs authorized to access each storage account. Ensure traffic is denied from all networks including trusted services, logging and metrics read access, and allow traffic only from authorized list (ref). Prevent access from unauthorized IPs, by allowing only authorized IP using Azure Storage Firewall.	High	2	1	-
Connect via private endpoint Maintain a list of authorized VNETs for the blob, file shares, queues, tables, DFS access via private endpoint. Ensure only authorized VNET are configured for the blob, file shares, queues, tables, DFS. Prevent the use of unauthorized VNETs by the storage account (e.g. by using Azure Policy).	High	2	1	-
Identify and ensure the protection all storage accounts hosting your objects Define an ACL or IAM authentication for every data Lake storage Gen2. Ideally use Azure AD only, and multiple DLS if fine-grained access is required.	Medium	1	-	-
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Maintain a list of authorized Groups to use in permissions for data Lake storage Gen2. Ensure only authorized Groups are used in ACLs for data Lake storage Gen2.	Low	4	-	-

Use name convention for Groups adding Suffix R/RW and Entity to be used. Integrate the access to directories and objects via ACL in the IAM Operating Model, not mixing IAM and ACL access method.				
Ensure no storage account allow public access to blob Ensure no storage accounts have allowblobPublicAccess enabled, except if authorized. Prevent the creation/update of storage accounts with allowblobPublicAccess enabled (e.g. using Azure Policy on deny mode - "[Preview]: storage account public access should be disallowed").	Very Low	1	1	-

Usage outdated protocols to access file shares

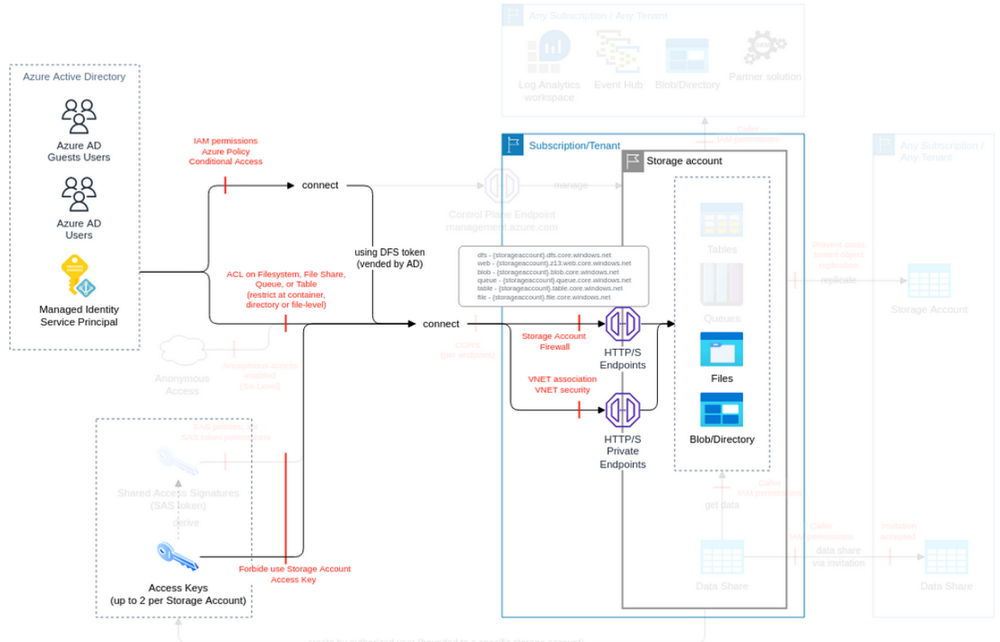
Threat Id	Storage.T21
Name	Usage outdated protocols to access file shares
Description	The primary reason to disable encryption in transit is to support a legacy application that must be run on an outdated operating system, such as Windows Server 2008 R2 or older Linux distribution. An attacker can hack old protocols and libraries to gain more permissions.
Goal	Launch another attack
MITRE ATT&CK®	TA0004
CVSS	High (7.1)
IAM Access	{}



Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Enforce encryption-in-transit Maintain a list of authorized encryption in transit methods with desired assignment to storage accounts. Ideally minimum TLS 1.2. Ensure authorized encryption in transit methods with desired assignment is set for authorized storage accounts. Ensure storage accounts have authorized encryption in transit methods configured (e.g. using Azure Policy in deny mode). Monitor the creation/update usage encryption in transit methods with desired assignment is set for authorized storage accounts (e.g. using activity logs on properties.supportsHttpsTrafficOnly scope "supportsHttpsTrafficOnly"). Maintain a list of authorized SMB 2.1 Azure Files. Ensure only authorized Azure Files SMB 2.1 have encryption disabled. Prevent unauthorized Azure Files SMB 2.1 to have encryption disabled (e.g. using Azure Policy in deny mode). Monitor the creation/update of Azure Files SMB 2.1 and corresponding settings (e.g. using activity logs on properties.supportsHttpsTrafficOnly scope "supportsHttpsTrafficOnly").	Very High	4	2	2

Privilege escalation by modifying file share ACL

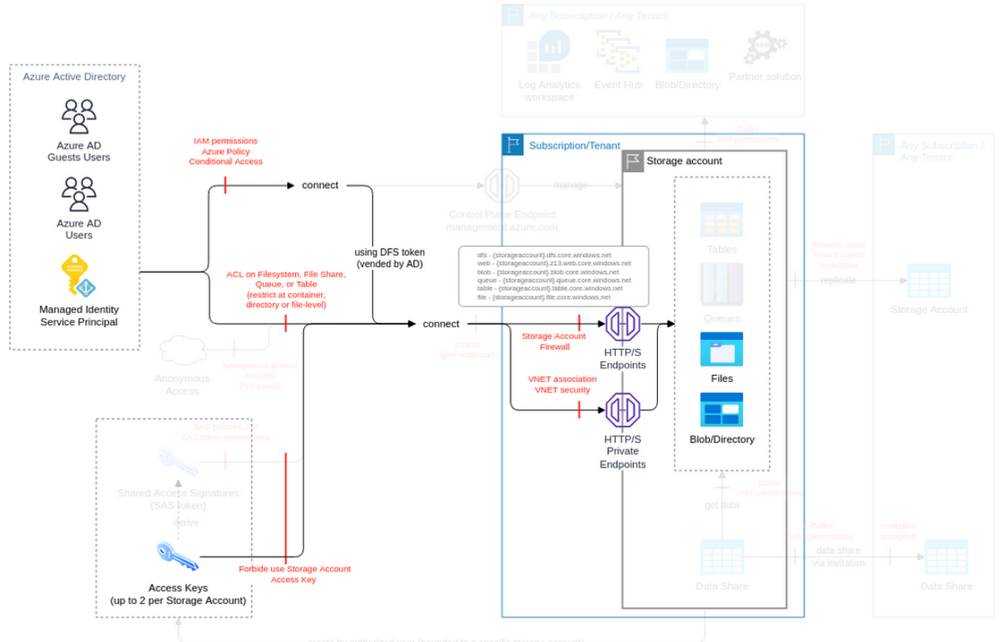
Threat Id	Storage.T17
Name	Privilege escalation by modifying file share ACL
Description	File share ACLs are used to limit access to entities via a file share endpoint. An attacker can modify those ACLs to escalate their own privileges.
Goal	Launch another attack
MITRE ATT&CK®	TA0004
CVSS	Medium (6.2)
IAM Access	{ "OR": ["Microsoft.Storage/storageAccounts/fileServices/fileshares/files/write", "Microsoft.Storage/storageAccounts/fileServices/fileshares/files/modifypermissions/action"] }



Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Integrate the access to blob, file shares, queues, tables and DFS via SAS token in the IAM Operating Model, ideally prioritising AD as preferred method. Block the usage of storage account access key, whenever possible.	Low	-	1	-
Protect primary data against loss Backup primary data in a location which have different security authority (ref 1, ref 2)	Very Low	1	-	-

Distribute malicious files via file share

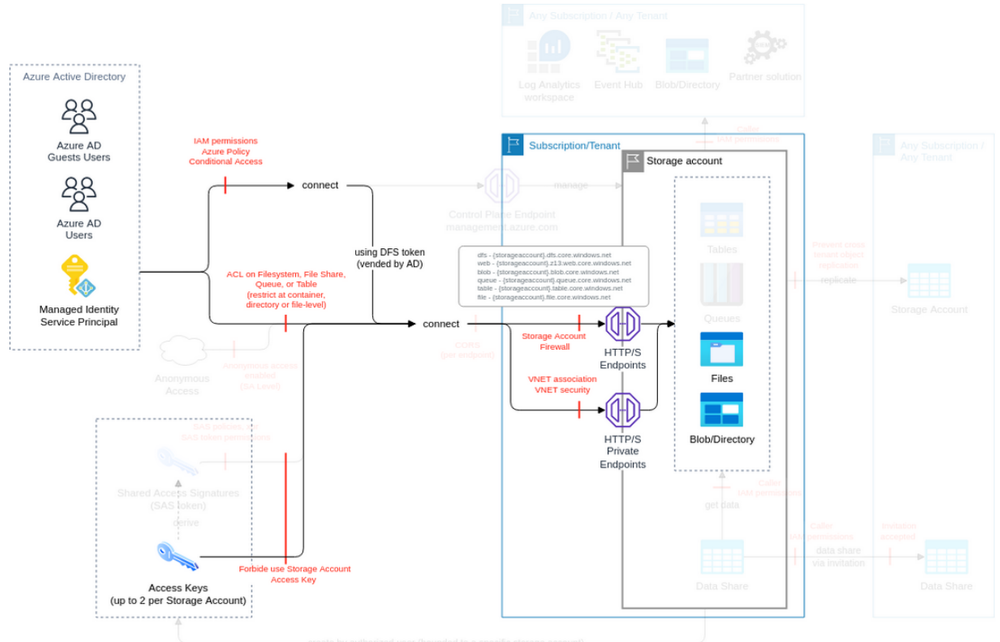
Threat Id	Storage.T20
Name	Distribute malicious files via file share
Description	An attacker can distribute malicious and infected files via Windows shares. An attacker can infect underlying services (especially VMs) in that way.
Goal	Launch another attack
MITRE ATT&CK®	TA0003
CVSS	Medium (4.9)
IAM Access	{ "UNIQUE": "Microsoft.Storage/storageAccounts/fileServices/fileshares/files/write" }



Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Enable soft-delete on containers, blobs, and file shares For each file share, define the minimum retention of container and blob from the deletion (e.g. 7 days) Ensure file shares have soft-delete enabled for at least the defined minimum retention Prevent the creation of file shares without soft-delete (e.g. by using an Azure Policy in deny mode). Ensure storage accounts have Azure Defender for Storage account enabled" with "Ensure storage accounts have Azure Defender for storage account enabled Prevent the creation of storage accounts without Azure Defender for storage account option (e.g. by using an Azure Policy "Microsoft.storage/storageaccounts/deleteRetentionPolicy" in deny mode). Ensure storage accounts have Azure Defender enabled Prevent the creation of storage accounts without Azure Defender (e.g. by using an Azure Policy in deny mode).	Medium	4	3	-
Protect primary data against loss Backup primary data in a location which have different security authority (ref 1, ref 2)	Low	1	-	-

Recursively delete directories and the content in the file share

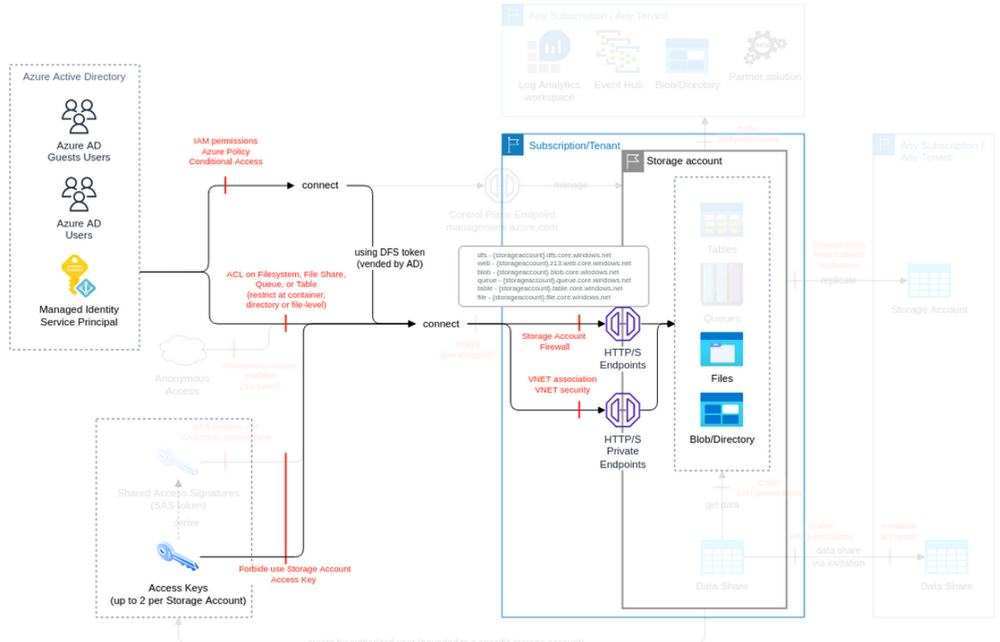
Threat Id	Storage.T18
Name	Recursively delete directories and the content in the file share
Description	File share similar to the DFS has hierarchical architecture. An attacker can potentially delete multiple directories and files recursively.
Goal	Disruption of Service
MITRE ATT&CK®	TA0040
CVSS	Medium (4.5)
IAM Access	{ "UNIQUE": "Microsoft.Storage/storageAccounts/fileServices/fileshares/files/delete" }



Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Enable soft-delete on containers, blobs, and file shares For each file share, define the minimum retention of container and blob from the deletion (e.g. 7 days) Ensure file shares have soft-delete enabled for at least the defined minimum retention Prevent the creation of file shares without soft-delete (e.g. by using an Azure Policy in deny mode).	Medium	2	1	-
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Integrate the access to blob, file shares, queues, tables and DFS via SAS token in the IAM Operating Model, ideally prioritising AD as preferred method.	Low	-	-	-
Protect primary data against loss Backup primary data in a location which have different security authority (ref 1, ref 2)	Low	1	-	-

Files encrypted by ransomware in file shares

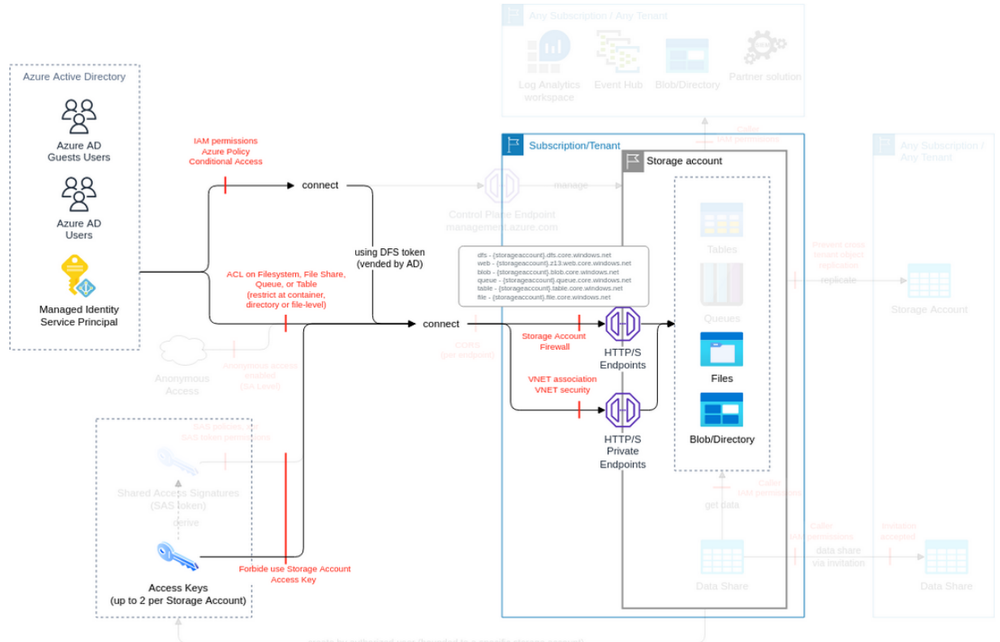
Threat Id	Storage.T19
Name	Files encrypted by ransomware in file shares
Description	An attacker can encrypt files making them unusable in file share using an encryption key not controlled by the file owner, to request a ransom to access the decryption key.
Goal	Direct Financial Gain
MITRE ATT&CK®	TA0040
CVSS	Medium (4.5)
IAM Access	{ "AND": ["Microsoft.Storage/storageAccounts/fileServices/fileshares/files/read", "Microsoft.Storage/storageAccounts/fileServices/fileshares/files/write", "directory:W;file:W"] }



Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Enable soft-delete on containers, blobs, and file shares For each file share, define the minimum retention of container and blob from the deletion (e.g. 7 days) Ensure file shares have soft-delete enabled for at least the defined minimum retention Prevent the creation of file shares without soft-delete (e.g. by using an Azure Policy in deny mode).	Medium	2	1	-
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Integrate the access to blob, file shares, queues, tables and DFS via SAS token in the IAM Operating Model, ideally prioritising AD as preferred method.	Low	-	-	-
Protect primary data against loss Backup primary data in a location which have different security authority (ref 1, ref 2)	Low	1	-	-

Increase billing by file share overflow

Threat Id	Storage.T16
Name	Increase billing by file share overflow
Description	An attacker can upload terabytes to the file share and cause billing implication - especially with soft deleted option.
Goal	Financial Drain
MITRE ATT&CK®	TA0040
CVSS	Low (3.5)
IAM Access	{ "UNIQUE": ["Microsoft.Storage/storageAccounts/fileServices/fileshares/files/write"] }

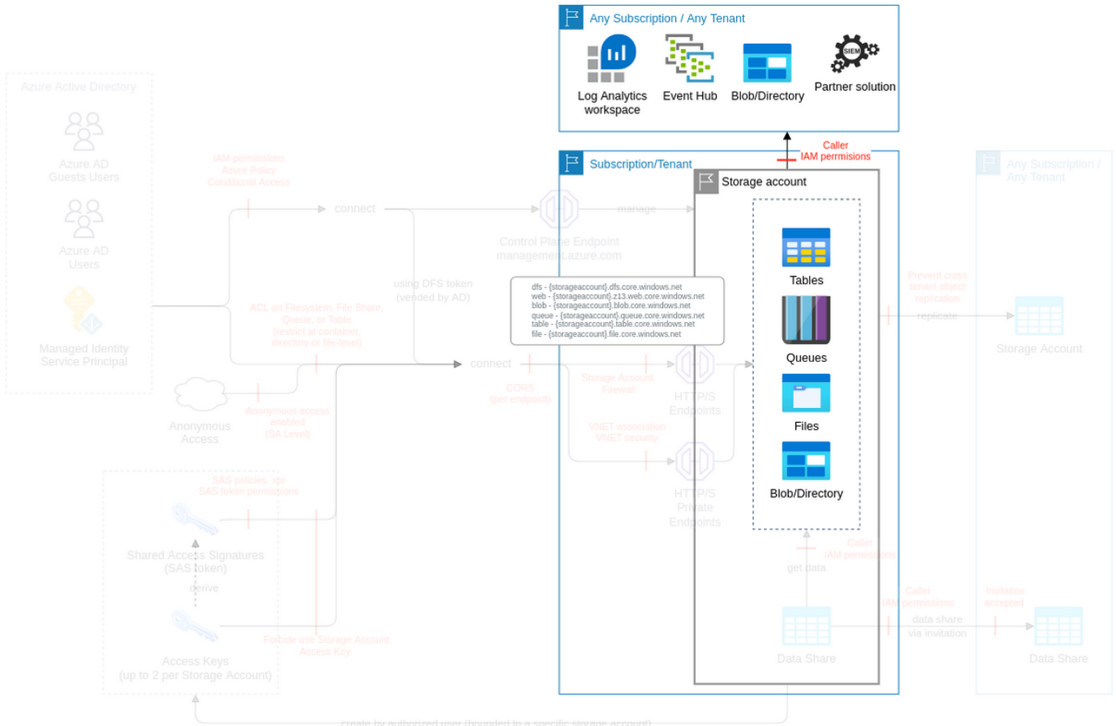


Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Enable storage accounts monitoring & notifications Monitor file shares quotas and trends using Azure Monitor with alarm (e.g. Azure file share size is 80% of capacity)	High	-	-	1
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Integrate the access to blob, file shares, queues, tables and DFS via SAS token in the IAM Operating Model, ideally prioritising AD as preferred method. Block the usage of storage account access key, whenever possible. Maintain a revocation plan for any SAS or storage account access keys that you issue to clients based on requirements. If a SAS is compromised, you need to revoke that SAS as soon as possible. To revoke a user delegation SAS, revoke the user delegation key to quickly invalidate all signatures associated with that key. To revoke a service SAS that is associated with a stored access policy, you can delete the stored access policy, rename the policy, or change its expiry time to a time that is in the past (ref). Ensure the revocation plan is in place for any SAS or storage account access key.	Very Low	2	1	-

Monitoring *(subclass of Storage account, FC8)*

Storage insights provides comprehensive monitoring of your Azure storage accounts by delivering a unified view of your Azure storage services performance, capacity, and availability.

Data Flow Diagram (DFD)



Actions and IAM Permissions to deny the feature

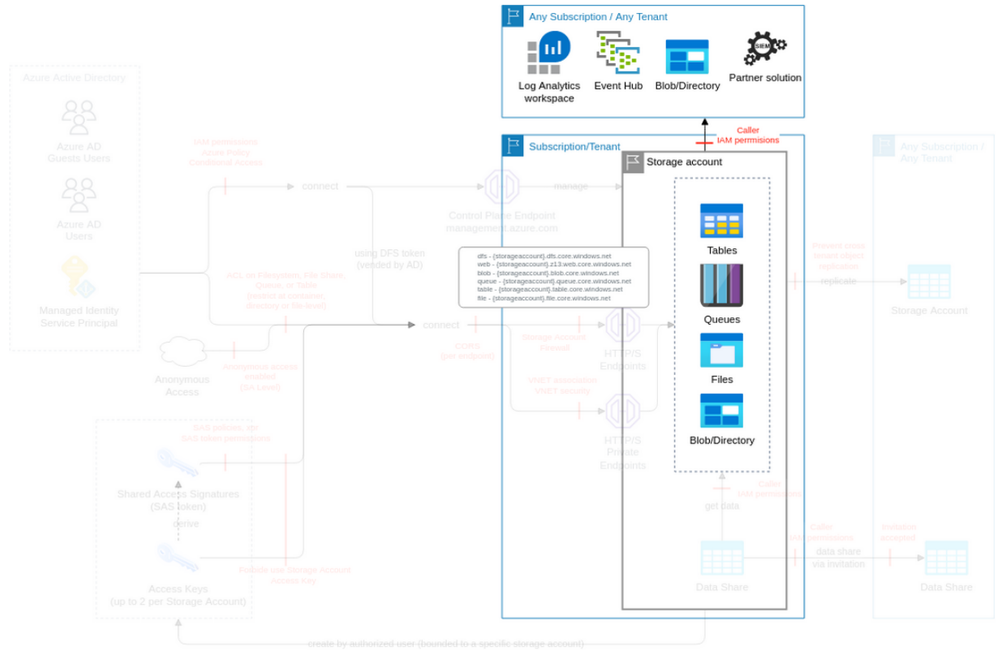
Action	IAM Permission
Creates or updates the diagnostic setting for the resource.	Microsoft.Storage/storageAccounts/providers/Microsoft.Insights/diagnosticsettings/write
Creates or updates the diagnostic setting for the resource.	Microsoft.Storage/storageAccounts/blobServices/providers/Microsoft.Insights/diagnosticsettings/write
Creates or updates the diagnostic setting for the resource.	Microsoft.Storage/storageAccounts/tableServices/providers/Microsoft.Insights/diagnosticsettings/write
Creates or updates the diagnostic setting for the resource.	Microsoft.Storage/storageAccounts/fileServices/providers/Microsoft.Insights/diagnosticsettings/write
Creates or updates the diagnostic setting for the resource.	Microsoft.Storage/storageAccounts/queueServices/providers/Microsoft.Insights/diagnosticsettings/write

Threat List

Name	CVSS
Exfiltrate data using diagnostic settings	Medium (4.2)

Exfiltrate data using diagnostic settings

Threat Id	Storage.T10
Name	Exfiltrate data using diagnostic settings
Description	Diagnostic settings can be set at storage account and/or blob level. An attacker can modify diagnostic settings, and send the storage accounts logs to another tenant/subscription to exfiltrate data.
Goal	Data theft
MITRE ATT&CK®	TA0010
CVSS	Medium (4.2)
IAM Access	{ "OR": ["Microsoft.Storage/storageAccounts/services/diagnosticsettings/write", "Microsoft.Storage/storageAccounts/providers/Microsoft.Insights/diagnosticsettings/write", "Microsoft.Storage/storageAccounts/blobServices/providers/Microsoft.Insights/diagnosticsettings/write", "Microsoft.Storage/storageAccounts/tableServices/providers/Microsoft.Insights/diagnosticsettings/write", "Microsoft.Storage/storageAccounts/fileServices/providers/Microsoft.Insights/diagnosticsettings/write", "Microsoft.Storage/storageAccounts/queueServices/providers/Microsoft.Insights/diagnosticsettings/write"] }

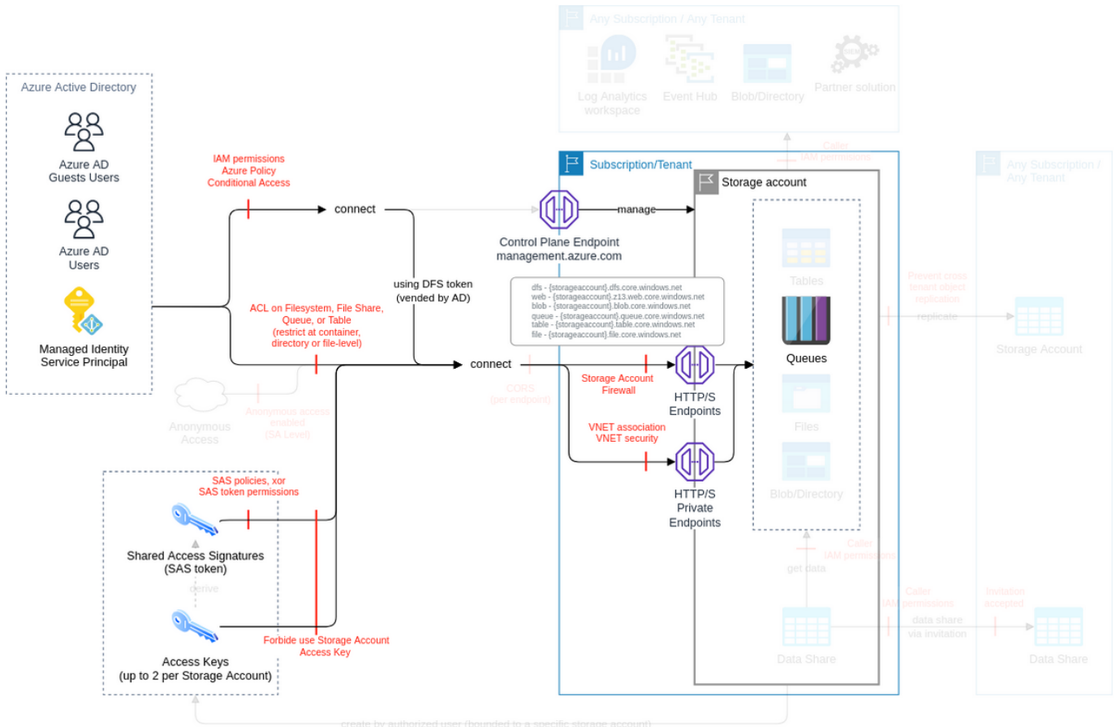


Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Enable storage accounts monitoring & notifications Define a diagnostic settings design for storage accounts including destination (tenant/subscription), categories (ideally all) and rotation, based on requirement. Resource logs are not collected by default. You must create a diagnostic setting for each Azure resource to send its resource logs to a Log Analytics workspace to use with Azure Monitor Logs, Azure Event Hubs to forward outside of Azure, or to Azure storage for archiving. Ensure diagnostic settings are configured properly to the architecture design. Ensure storage accounts have diagnostic settings configured according to the design. Monitor the creation/update of storage accounts with diagnostic settings enabled (e.g. using activity logs on operation name - create or update resource diagnostic setting)	Very High	2	1	1

Queues *(subclass of Storage account, FC4)*

Azure queue storage is a service for storing large numbers of messages. Access messages via HTTP/S calls.

Data Flow Diagram (DFD)



Actions and IAM Permissions to deny the feature

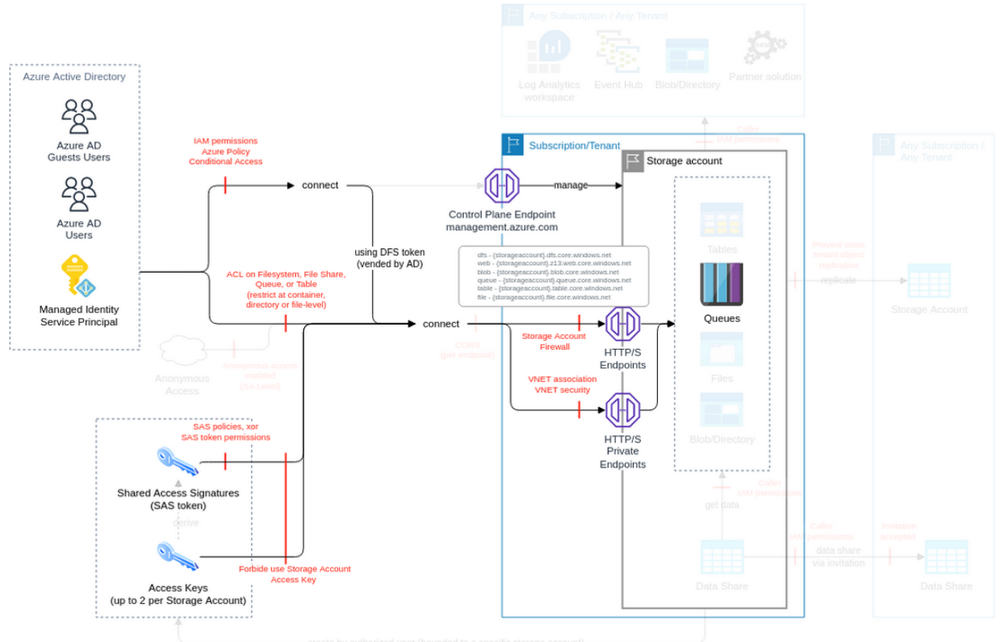
Action	IAM Permission
Create a queue	Microsoft.Storage/storageAccounts/queueServices/queues/write

Threat List

Name	CVSS
Privilege escalation by modifying queue ACL	Medium (6.2)
Unauthorized access to a sensitive message	Medium (6.1)
Impacting queues messages integrity or complete data loss of sensitive data	Medium (5.2)

Privilege escalation by modifying queue ACL

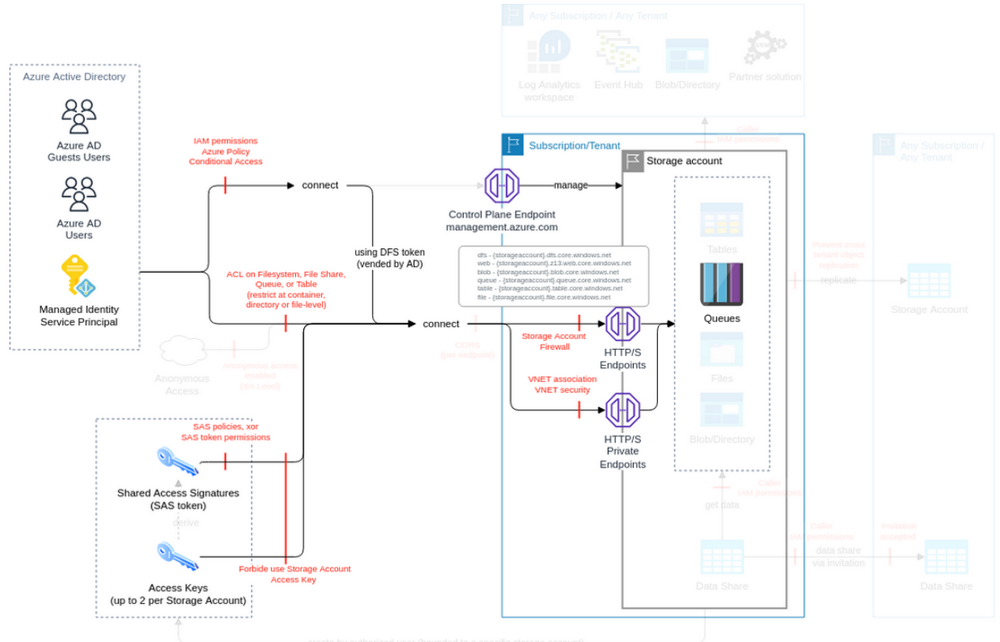
Threat Id	Storage.T27
Name	Privilege escalation by modifying queue ACL
Description	Queue ACLs are used to limit access to entities via the queue share endpoint. An attacker can modify those ACLs to escalate their own privileges.
Goal	Launch another attack
MITRE ATT&CK®	TA0004
CVSS	Medium (6.2)
IAM Access	{ "OR": ["Microsoft.Storage/storageAccounts/queueServices/write", "Microsoft.Storage/storageAccounts/queueServices/queues/write"] }



Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Integrate the access to blob, file shares, queues, tables and DFS via SAS token in the IAM Operating Model, ideally prioritising AD as preferred method. Block the usage of storage account access key, whenever possible.	Low	-	1	-

Unauthorized access to a sensitive message

Threat Id	Storage.T32
Name	Unauthorized access to a sensitive message
Description	An attacker can get access to the sensitive message or modify the message that will be consumed by other services and in that way access to other services.
Goal	Data theft
MITRE ATT&CK®	TA0010
CVSS	Medium (6.1)
IAM Access	{ "OR": ["Microsoft.Storage/storageAccounts/queueServices/write", "Microsoft.Storage/storageAccounts/queueServices/queues/write"] }

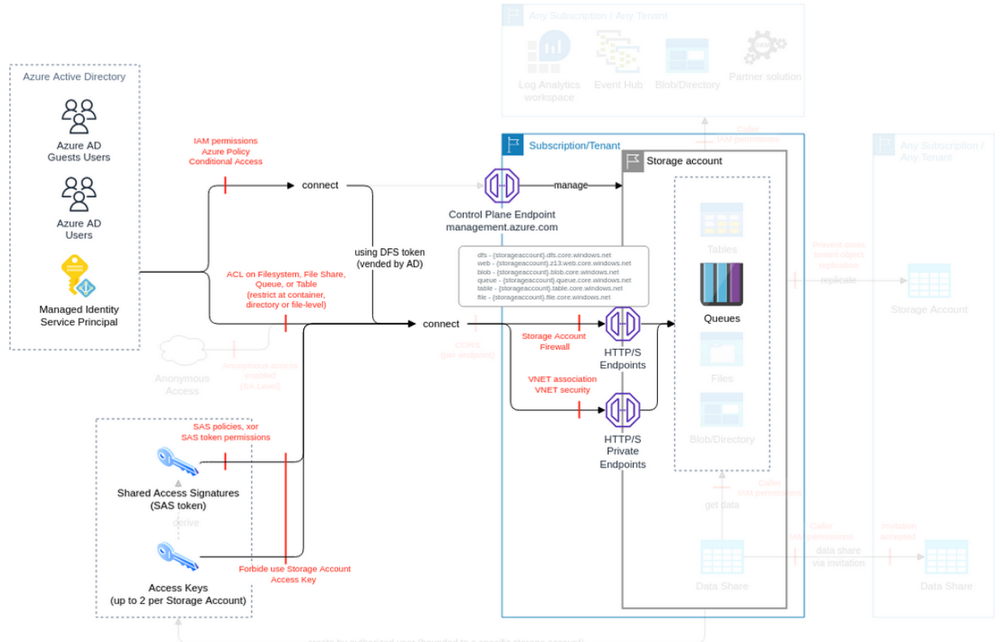


Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Limit the access to the IAM actions required to perform attacks using Azure IAM, following the IAM Operating Model and using the Azure IAM ThreatModel.	Very High	1	-	-
Block access to the endpoints Maintain a list of IPs authorized to access each storage account. Ensure traffic is denied from all networks including trusted services, logging and metrics read access, and allow traffic only from authorized list (ref). Prevent access from unauthorized IPs, by allowing only authorized IP using Azure Storage Firewall.	High	2	1	-
Connect via private endpoint Maintain a list of authorized VNETs for the blob, file shares, queues, tables, DFS access via private endpoint. Ensure only authorized VNET are configured for the blob, file shares, queues, tables, DFS. Prevent the use of unauthorized VNETs by the storage account (e.g. by using Azure Policy).	High	2	1	-
Identify and ensure the protection all storage accounts hosting your objects Maintain a list of authorized IPs to use SAS tokens, and their authorized time window. Ensure SAS tokens allow only authorized IPs, using the sourceIP field and enforcing HTTPS.	Medium	2	-	-

Integrate ACLs in the IAM Operating Model to allow non-AD access files and directories Integrate the access to files and directories via ACL in the IAM Operating Model	Low	1	-	-

Impacting queues messages integrity or complete data loss of sensitive data

Threat Id	Storage.T31
Name	Impacting queues messages integrity or complete data loss of sensitive data
Description	Messages in queues can be purged and deleted; queues can themselves be deleted with all the messages, and queues parameters changes can result in loss of all the messages. An attacker can delete or alter the messages and queues using any of those methods impacting downstream applications and processes and causing loss of integrity and DoS.
Goal	Data manipulation
MITRE ATT&CK®	TA0040
CVSS	Medium (5.2)
IAM Access	{ "OR": ["Microsoft.Storage/storageAccounts/queueServices/write", "Microsoft.Storage/storageAccounts/queueServices/queues/write", "Microsoft.Storage/storageAccounts/queueServices/queues/delete"] }



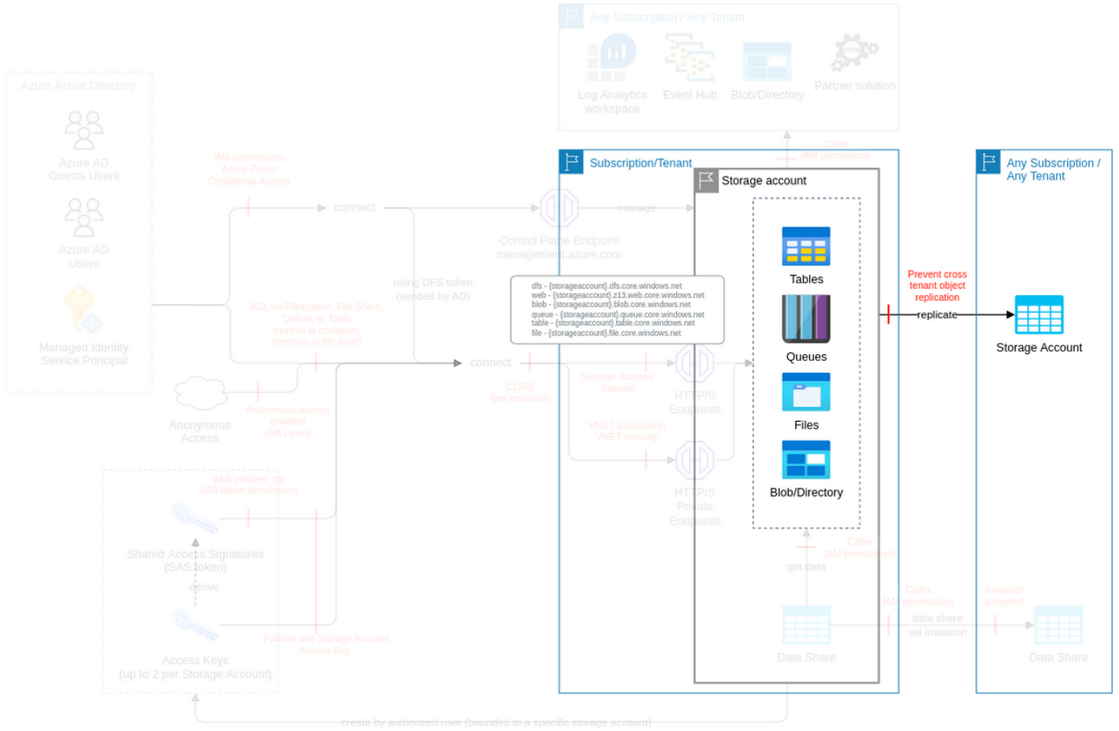
Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Limit the access to the IAM actions required to perform attacks using Azure IAM, following the IAM Operating Model and using the Azure IAM ThreatModel.	Very High	1	-	-
Block access to the endpoints Maintain a list of IPs authorized to access each storage account. Ensure traffic is denied from all networks including trusted services, logging and metrics read access, and allow traffic only from authorized list (ref). Prevent access from unauthorized IPs, by allowing only authorized IP using Azure Storage Firewall.	High	2	1	-
Connect via private endpoint Maintain a list of authorized VNETs for the blob, file shares, queues, tables, DFS access via private endpoint. Ensure only authorized VNET are configured for the blob, file shares, queues, tables, DFS. Prevent the use of unauthorized VNETs by the storage account (e.g. by using Azure Policy).	High	2	1	-
Identify and ensure the protection all storage accounts hosting your objects Maintain a list of authorized IPs to use SAS tokens, and their authorized time window. Ensure SAS tokens allow only authorized IPs, using the sourceIP field and enforcing HTTPS.	Medium	2	-	-

Integrate ACLs in the IAM Operating Model to allow non-AD access files and directories Integrate the access to files and directories via ACL in the IAM Operating Model	Low	1	-	-

Replication *(subclass of Storage account, FC9)*

Azure storage always stores multiple copies of data. It protects from planned and unplanned events, including transient hardware failures, network or power outages, and massive natural disasters. Redundancy ensures that your storage account meets its availability and durability targets even in the face of failures.

Data Flow Diagram (DFD)



Actions and IAM Permissions to deny the feature

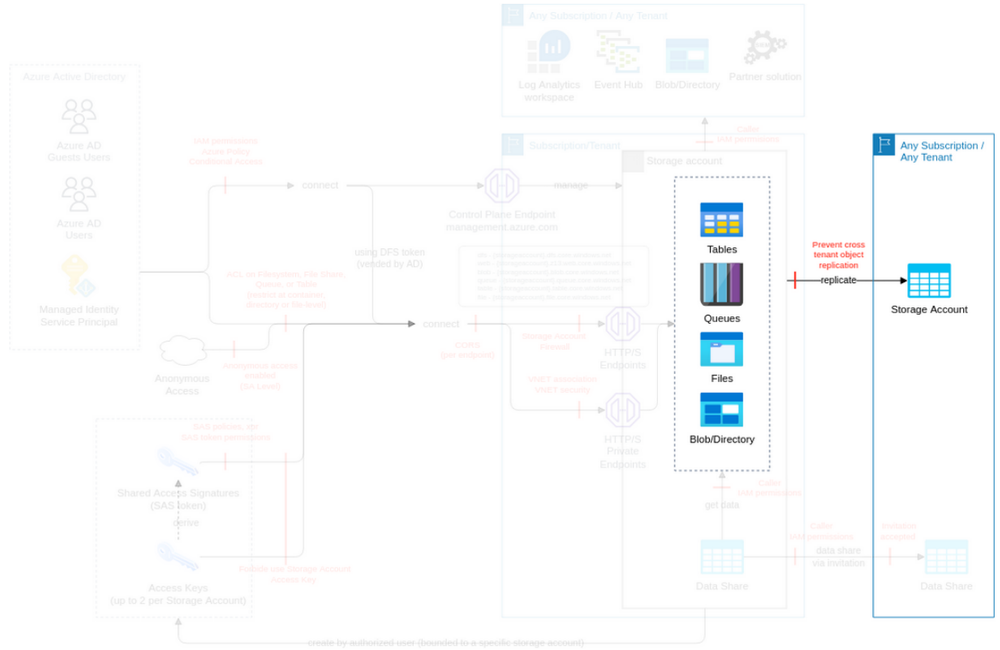
Action	IAM Permission
Encryption	Microsoft.Storage/storageAccounts/encryptionScopes/write
Create or update object replication policy	Microsoft.Storage/storageAccounts/objectReplicationPolicies/write

Threat List

Name	CVSS
Unauthorised access to data via storage account replication	Medium (4.9)

Unauthorised access to data via storage account replication

Threat Id	Storage.T13
Name	Unauthorised access to data via storage account replication
Description	Replication allows you to replicate objects and their metadata. At this moment it is not available for DFS, but in future will be, that can be additional attack vector. An attacker can configure replication on a storage account to replicate objects (or its metadata or tagging) to exfiltrate data.
Goal	Data theft
MITRE ATT&CK®	TA0010
CVSS	Medium (4.9)
IAM Access	{ "UNIQUE": "Microsoft.Storage/storageAccounts/write" }

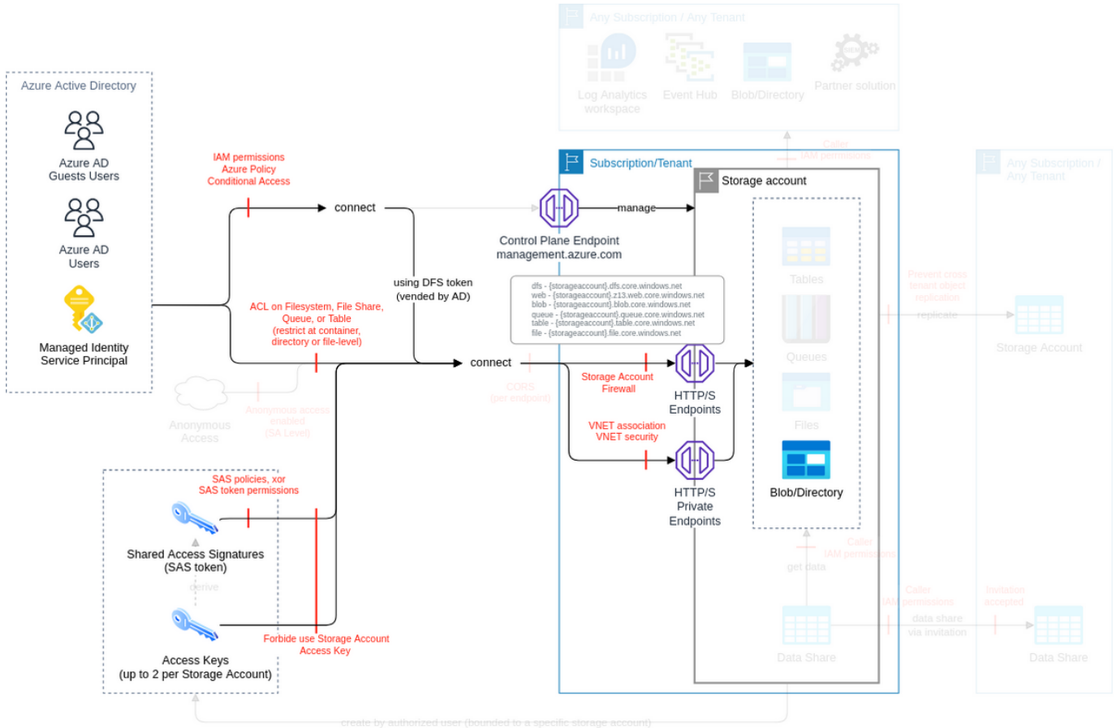


Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Protect primary data against loss Maintain a list of objects with cross-tenant replication enabled. Ensure cross-tenant replication is allowed only for specific storage accounts.	Medium	2	-	-
Enable storage accounts monitoring & notifications Define a diagnostic settings design for storage accounts including destination (tenant/subscription), categories (ideally all) and rotation, based on requirement. Resource logs are not collected by default. You must create a diagnostic setting for each Azure resource to send its resource logs to a Log Analytics workspace to use with Azure Monitor Logs, Azure Event Hubs to forward outside of Azure, or to Azure storage for archiving. Ensure diagnostic settings are configured properly to the architecture design. Ensure storage accounts have diagnostic settings configured according to the design.	Low	2	1	-

Tables *(subclass of Storage account, FC5)*

The most economic table style storage over the word to store petabytes of semi-structured data and keep costs down.

Data Flow Diagram (DFD)



Actions and IAM Permissions to deny the feature

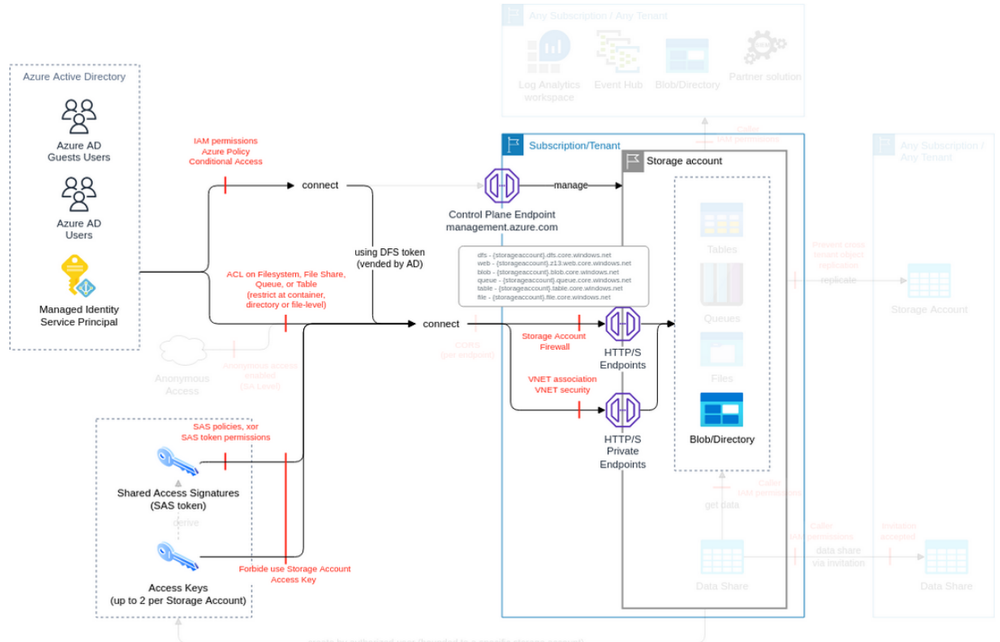
Action	IAM Permission
Create tables	Microsoft.Storage/storageAccounts/tableServices/tables/write

Threat List

Name	CVSS
Privilege escalation by modifying table ACL	Medium (6.2)

Privilege escalation by modifying table ACL

Threat Id	Storage.T28
Name	Privilege escalation by modifying table ACL
Description	Table ACLs are used to limit access to entities via the table endpoint. An attacker can modify those ACLs to escalate their own privileges.
Goal	Launch another attack
MITRE ATT&CK®	TA0004
CVSS	Medium (6.2)
IAM Access	{ "OR": ["Microsoft.Storage/storageAccounts/tableServices/write", "Microsoft.Storage/storageAccounts/tableServices/tables/write"] }

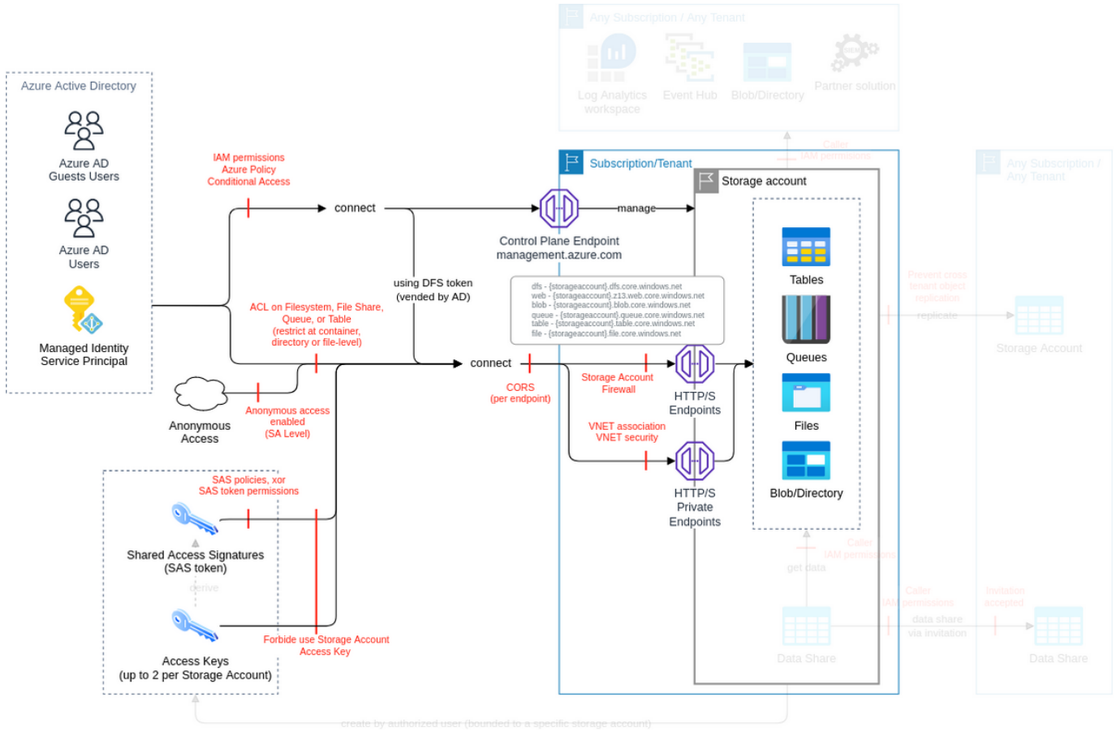


Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Integrate the access to blob, file shares, queues, tables and DFS via SAS token in the IAM Operating Model, ideally prioritising AD as preferred method. Block the usage of storage account access key, whenever possible.	Low	-	1	-

Blob storage, containers, data Lake storage Gen2 *(subclass of Storage account, FC2)*

Data Lake storage Gen2 is the storage for big data analysis based on Azure blob storage.

Data Flow Diagram (DFD)



Actions and IAM Permissions to deny the feature

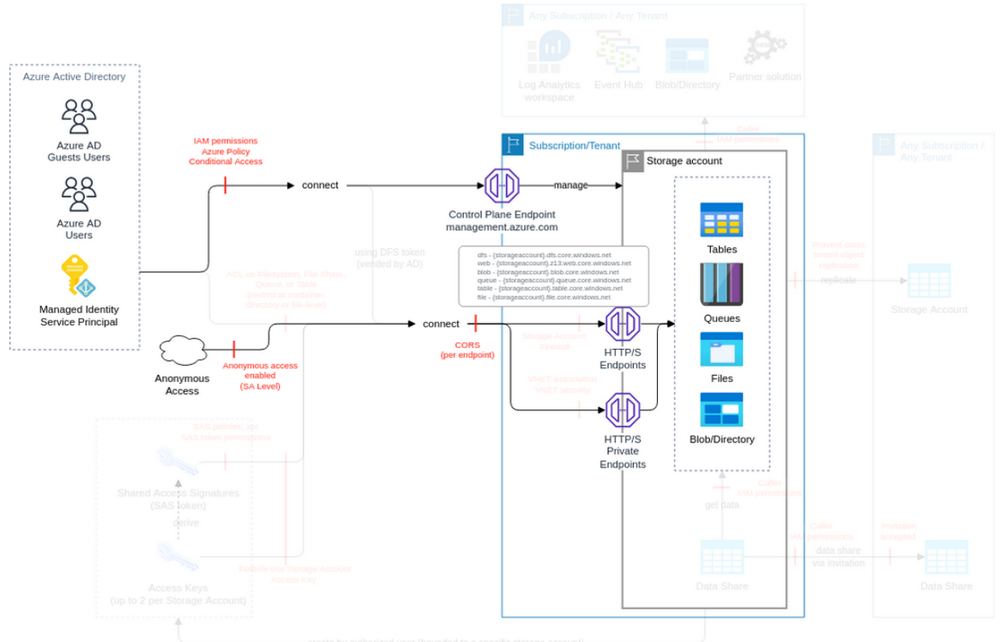
Action	IAM Permission
Create a filesystem rooted at the specified location. If the filesystem already exists, the operation fails. This operation does not support conditional HTTP requests.	Microsoft.Storage/storageAccounts/blobServices/containers/write

Threat List

Name	CVSS
Unauthorized data made public	High (8.1)
Unauthorized access to data using a rogue DFS endpoint	High (7.3)
Distribute malicious infected files via a reputed web address	High (7.1)
Privilege escalation by modifying file system ACL	Medium (6.2)
Files encrypted by ransomware in DFS/blob	Medium (6.1)
Infect with malware downstream processes	Medium (5.4)
Unauthorised modification of data	Medium (5.2)
Recursively delete DFS directories and their content	Medium (4.5)

Unauthorized data made public

Threat Id	Storage.T5
Name	Unauthorized data made public
Description	An attacker (or someone by negligence) can create/modify a container to make it public and steal/exfiltrate/expose data.
Goal	Data theft
MITRE ATT&CK®	TA0010
CVSS	High (8.1)
IAM Access	{ "OR": ["Microsoft.Storage/storageAccounts/blobServices/write", "Microsoft.Storage/storageAccounts/blobServices/containers/blobs/write", "Microsoft.Storage/storageAccounts/blobServices/containers/write"] }

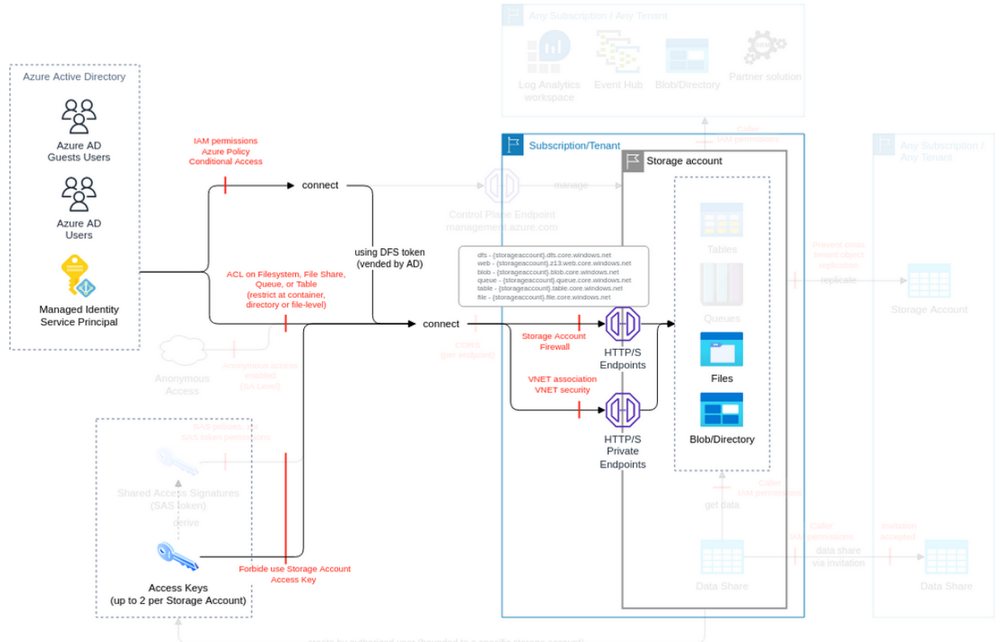


Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Limit the access to the IAM actions required to perform attacks using Azure IAM, following the IAM Operating Model and using the Azure IAM ThreatModel. Limit access to delete storage accounts, via Azure Policy and IAM. Do not ever delete a sensitive storage account (e.g. just delete all data) to make sure that storage account FQDN cannot be used as a source of attacks.	Very High	1	1	-
Protect primary data against loss Maintain a list of objects with cross-tenant replication enabled. Ensure cross-tenant replication is allowed only for specific storage accounts. Maintain a list of authorized storage and corresponding accounts locks. Lock storage account to prevent accidental or malicious deletion or configuration changes and ensure only authorized storage accounts have lock disabled.	Very High	4	-	-
Block access to the endpoints Maintain a list of IPs authorized to access each storage account. Ensure traffic is denied from all networks including trusted services, logging and metrics read access, and allow traffic only from authorized list (ref).	High	2	-	-
Enable soft-delete on containers, blobs, and file shares Maintain a list of authorized blob and containers with public access level set to anonymous, ideally none	High	4	3	1

Ensure anonymous access level is set only for authorized blobs / containers. Ensure only authorized blob and containers are anonymously accessed (e.g. using Azure Policy in deny mode). Monitor the creation/update of blob and containers that are anonymously accessed (e.g. using Azure Automations). Ensure storage accounts have Azure Defender for Storage account enabled" with "Ensure storage accounts have Azure Defender for storage account enabled Prevent the creation of storage accounts without Azure Defender for storage account option (e.g. by using an Azure Policy "Microsoft.storage/storageaccounts/deleteRetentionPolicy" in deny mode). Ensure storage accounts have Azure Defender enabled Prevent the creation of storage accounts without Azure Defender (e.g. by using an Azure Policy in deny mode).				
Connect via private endpoint Maintain a list of authorized VNETs for the blob, file shares, queues, tables, DFS access via private endpoint. Ensure only authorized VNET are configured for the blob, file shares, queues, tables, DFS. Prevent the use of unauthorized VNETs by the storage account (e.g. by using Azure Policy).	High	2	1	-
Identify and ensure the protection all storage accounts hosting your objects Define an ACL or IAM authentication for every data Lake storage Gen2. Ideally use Azure AD only, and multiple DLS if fine-grained access is required. Use a data discovery tool to control that no sensitive data are stored in unauthorized storage account Use a data discovery tool to ensure the storage account names, object names, and tags do not contain sensitive data	Medium	1	-	2
Enable storage accounts monitoring & notifications Define a diagnostic settings design for storage accounts including destination (tenant/subscription), categories (ideally all) and rotation, based on requirement. Resource logs are not collected by default. You must create a diagnostic setting for each Azure resource to send its resource logs to a Log Analytics workspace to use with Azure Monitor Logs, Azure Event Hubs to forward outside of Azure, or to Azure storage for archiving. Ensure diagnostic settings are configured properly to the architecture design. Ensure storage accounts have diagnostic settings configured according to the design.	Low	2	1	-
Ensure no storage account allow public access to blob Maintain a list of authorized storage accounts with allowblobPublicAccess enabled, ideally none Ensure no storage accounts have allowblobPublicAccess enabled, except if authorized. Prevent the creation/update of storage accounts with allowblobPublicAccess enabled (e.g. using Azure Policy on deny mode - "[Preview]: storage account public access should be disallowed").	Low	2	1	-

Unauthorized access to data using a rogue DFS endpoint

Threat Id	Storage.T30
Name	Unauthorized access to data using a rogue DFS endpoint
Description	An attacker can create an unauthorised DFS endpoint to gain access to the data in the blob.
Goal	Data theft
MITRE ATT&CK®	TA0010
CVSS	High (7.3)
IAM Access	{ "AND": ["Microsoft.Storage/storageAccounts/blobServices/containers/blobs/write", "Microsoft.Storage/storageAccounts/blobServices/containers/write"] }

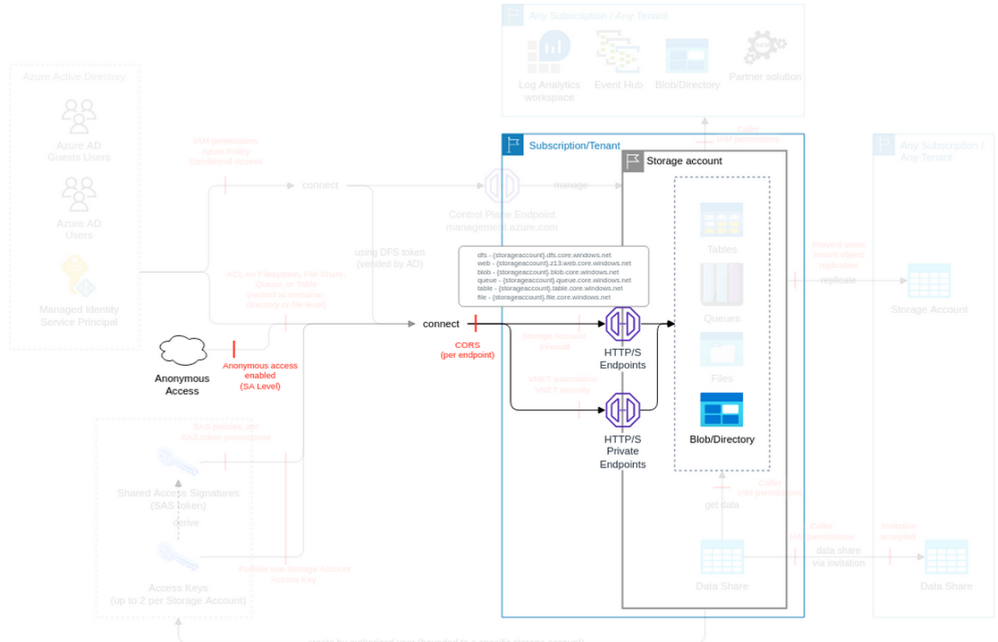


Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Block access to the endpoints Maintain a list of IPs authorized to access each storage account. Ensure traffic is denied from all networks including trusted services, logging and metrics read access, and allow traffic only from authorized list (ref). Prevent access from unauthorized IPs, by allowing only authorized IP using Azure Storage Firewall.	High	2	1	-
Connect via private endpoint Maintain a list of authorized VNETs for the blob, file shares, queues, tables, DFS access via private endpoint. Ensure only authorized VNET are configured for the blob, file shares, queues, tables, DFS. Prevent the use of unauthorized VNETs by the storage account (e.g. by using Azure Policy).	High	2	1	-
Identify and ensure the protection all storage accounts hosting your objects Define an ACL or IAM authentication for every data Lake storage Gen2. Ideally use Azure AD only, and multiple DLS if fine-grained access is required.	Medium	1	-	-
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Maintain a list of authorized Groups to use in permissions for data Lake storage Gen2. Ensure only authorized Groups are used in ACLs for data Lake storage Gen2.	Low	4	-	-

Use name convention for Groups adding Suffix R/RW and Entity to be used. Integrate the access to directories and objects via ACL in the IAM Operating Model, not mixing IAM and ACL access method.				
Enable hierarchical namespace in storage account, only when required Maintain a list of authorized storage accounts with hierarchical namespace (DFS) option enabled. Ensure only authorized storage accounts with hierarchical namespace (DFS) option enabled are configured	Low	2	-	-
Ensure no storage account allow public access to blob Ensure no storage accounts have allowblobPublicAccess enabled, except if authorized. Prevent the creation/update of storage accounts with allowblobPublicAccess enabled (e.g. using Azure Policy on deny mode - "[Preview]: storage account public access should be disallowed").	Very Low	1	1	-

Distribute malicious infected files via a reputed web address

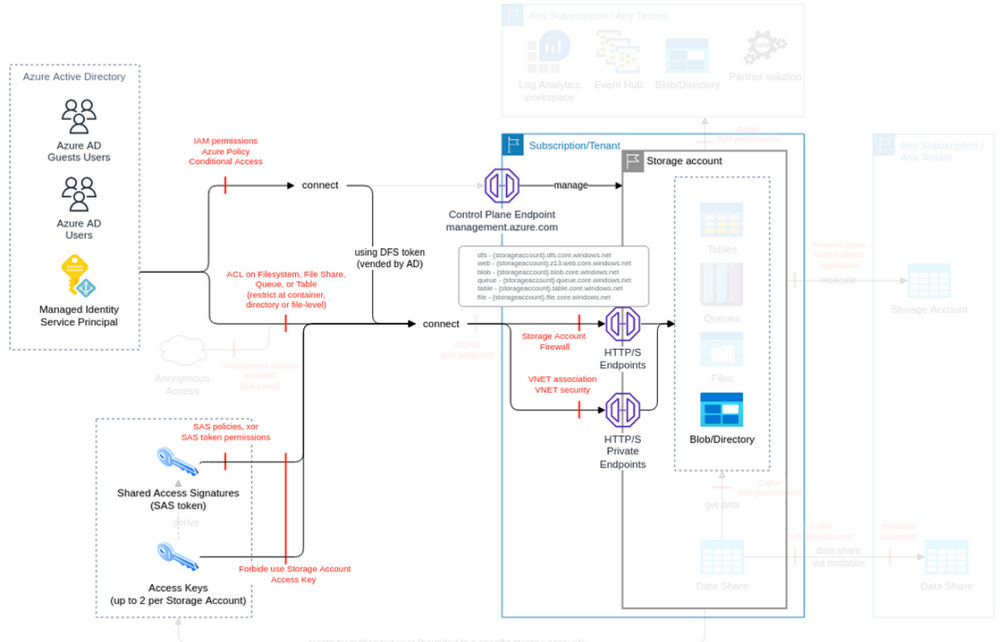
Threat Id	Storage.T22
Name	Distribute malicious infected files via a reputed web address
Description	Storage account can be configured as a static website server. An attacker can distribute malicious and infected files via a website hosted on a storage account.
Goal	Launch another attack
MITRE ATT&CK®	TA0003
CVSS	High (7.1)
IAM Access	{ "UNIQUE": "Microsoft.Storage/storageAccounts/blobServices/containers/blobs/write" }



Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Block access to the endpoints Maintain a list of authorized storage accounts has static website hosting option enabled, ideally none	High	1	-	-
Ensure no storage account allow public access to blob Ensure only authorized storage accounts has the static website hosting option enabled. Prevent unauthorized storage accounts to have the static website hosting option enabled (e.g. using Azure Policy on deny mode).	High	1	1	-

Privilege escalation by modifying file system ACL

Threat Id	Storage.T6
Name	Privilege escalation by modifying file system ACL
Description	Filesystem ACLs are used to limit access to entities via the filesystem endpoint. An attacker can modify those ACLs to escalate their own privileges.
Goal	Launch another attack
MITRE ATT&CK®	TA0004
CVSS	Medium (6.2)
IAM Access	{ "UNIQUE": "Microsoft.Storage/storageAccounts/blobServices/containers/blobs/write" }

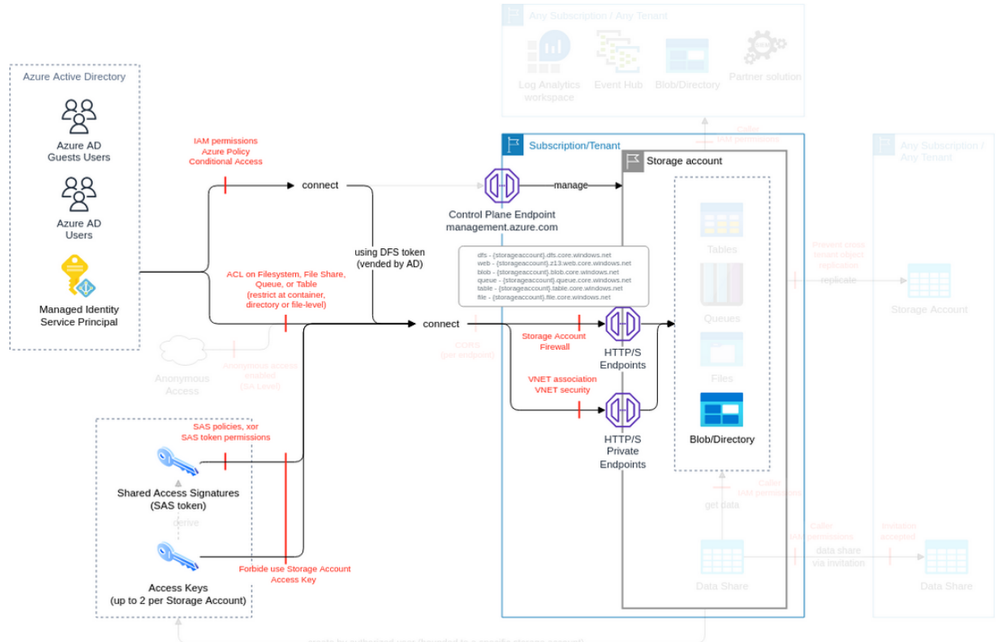


Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Limit the access to the IAM actions required to perform attacks using Azure IAM, following the IAM Operating Model and using the Azure IAM ThreatModel. Maintain a list of authorized Groups to use in permissions for data Lake storage Gen2. Maintain an architecture of data Lake storage Gen2 ACL vs IAM based on requirements. Microsoft recommends using Azure Active Directory (Azure AD) to authorize requests against blob and queue data, if possible, instead of Shared Key. Azure AD provides superior security and ease of use over Shared Key. Integrate the access to directories and objects via ACL in the IAM Operating Model, not mixing IAM and ACL access method.	Very High	4	-	-
Block access to the endpoints Ensure traffic is denied from all networks including trusted services, logging and metrics read access, and allow traffic only from authorized list (ref).	High	1	-	-
Enable soft-delete on containers, blobs, and file shares Ensure storage accounts have soft-delete for the blob enabled Maintain a list of authorized blob and containers with public access level set to anonymous, ideally none Ensure anonymous access level is set only for authorized blobs / containers. Ensure only authorized blob and containers are anonymously accessed (e.g. using Azure Policy in deny mode). Monitor the creation/update of blob and containers that are anonymously accessed (e.g. using Azure Automations).	High	3	1	1

Connect via private endpoint Maintain a list of authorized VNETs for the blob, file shares, queues, tables, DFS access via private endpoint. Ensure only authorized VNET are configured for the blob, file shares, queues, tables, DFS. Prevent the use of unauthorized VNETs by the storage account (e.g. by using Azure Policy).	High	2	1	-
Protect primary data against loss Ensure cross-tenant replication is allowed only for specific storage accounts.	Medium	1	-	-
Ensure no storage account allow public access to blob Prevent the creation/update of storage accounts with allowblobPublicAccess enabled (e.g. using Azure Policy on deny mode - "[Preview]: storage account public access should be disallowed").	Low	-	1	-
Enable hierarchical namespace in storage account, only when required Maintain a list of authorized storage accounts with hierarchical namespace (DFS) option enabled. Ensure only authorized storage accounts with hierarchical namespace (DFS) option enabled are configured	Low	2	-	-

Files encrypted by ransomware in DFS/blob

Threat Id	Storage.T9
Name	Files encrypted by ransomware in DFS/blob
Description	An attacker can encrypt files/objects in DFS or blobs using an encryption key not controlled by the owner, to request a ransom to access the decryption key.
Goal	Direct Financial Gain
MITRE ATT&CK®	TA0040
CVSS	Medium (6.1)
IAM Access	{ "OR": ["Microsoft.Storage/storageAccounts/blobServices/containers/blobs/write", "directory:RWX;file:RWX"] }

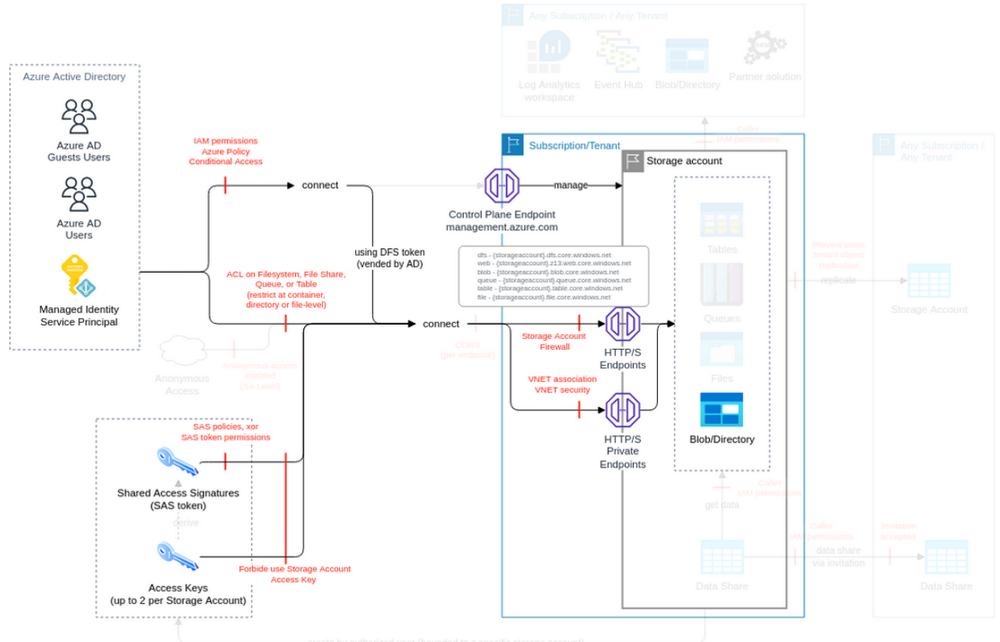


Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Limit the access to the IAM actions required to perform attacks using Azure IAM, following the IAM Operating Model and using the Azure IAM ThreatModel. Ensure only authorized Groups are used in ACLs for data Lake storage Gen2. Use name convention for Groups adding Suffix R/RW and Entity to be used. Maintain an architecture of data Lake storage Gen2 ACL vs IAM based on requirements. Microsoft recommends using Azure Active Directory (Azure AD) to authorize requests against blob and queue data, if possible, instead of Shared Key. Azure AD provides superior security and ease of use over Shared Key. Integrate the access to directories and objects via ACL in the IAM Operating Model, not mixing IAM and ACL access method. Block the usage of storage account access key, whenever possible.	Very High	5	1	-
Enable storage accounts monitoring & notifications Maintain a list of directories and blobs that do not need modification after uploading to DFS/blob. Define a diagnostic settings design for storage accounts including destination (tenant/subscription), categories (ideally all) and rotation, based on requirement. Resource logs are not collected by default. You must create a diagnostic setting for each Azure resource to send its resource logs to a Log Analytics workspace to use with Azure Monitor Logs, Azure Event Hubs to forward outside of Azure, or to Azure storage for archiving. Ensure diagnostic settings are configured properly to the architecture design. Ensure storage accounts have diagnostic settings configured according to the design.	Very High	3	1	-

Identify and ensure the protection all storage accounts hosting your objects Ensure SAS tokens allow only authorized IPs, using the sourceIP field and enforcing HTTPS. Use immutable blobs.	Very High	2	-	-
Block access to the endpoints Maintain a list of IPs authorized to access each storage account. Ensure traffic is denied from all networks including trusted services, logging and metrics read access, and allow traffic only from authorized list (ref).	High	2	-	-
Connect via private endpoint Maintain a list of authorized VNETs for the blob, file shares, queues, tables, DFS access via private endpoint. Ensure only authorized VNET are configured for the blob, file shares, queues, tables, DFS. Prevent the use of unauthorized VNETs by the storage account (e.g. by using Azure Policy).	High	2	1	-
Protect primary data against loss Ensure corporate backup policies are implemented for the blob, file shares, queues, tables, DFS, including regular testing.	Medium	1	-	-
Enable soft-delete on containers, blobs, and file shares For each storage account (or type of data), define the minimum retention of container and blob from the deletion (e.g. 7 days) Ensure storage accounts have soft-delete for the blob enabled for at least the defined minimum retention Prevent the creation of storage accounts without soft-delete for the blob option (e.g. by using an Azure Policy in deny mode). Ensure storage accounts have soft-delete for the container enabled Prevent the creation of storage accounts without soft-delete for the container option (e.g. by using an Azure Policy in deny mode). Ensure storage accounts have soft-delete for the blob enabled Prevent the creation of storage accounts without soft-delete for the blob option (e.g. by using an Azure Policy "Microsoft.storage/storageaccounts/deleteRetentionPolicy" in deny mode). Ensure storage accounts have soft-delete for the container enabled Prevent the creation of storage accounts without soft-delete for the container option (e.g. by using an Azure Policy in deny mode).	Medium	5	4	-
Integrate ACLs in the IAM Operating Model to allow non-AD access files and directories Integrate the access to files and directories via ACL in the IAM Operating Model	Very Low	1	-	-

Infect with malware downstream processes

Threat Id	Storage.T12
Name	Infect with malware downstream processes
Description	An attacker can distribute malicious and infected files via an object used by downstream services or a reputed company URL. An attacker can upload a malware instead of a valid file, and infect internal services or external users.
Goal	Launch another attack
MITRE ATT&CK®	TA0003
CVSS	Medium (5.4)
IAM Access	{ "UNIQUE": "Microsoft.Storage/storageAccounts/blobServices/containers/blobs/write" }

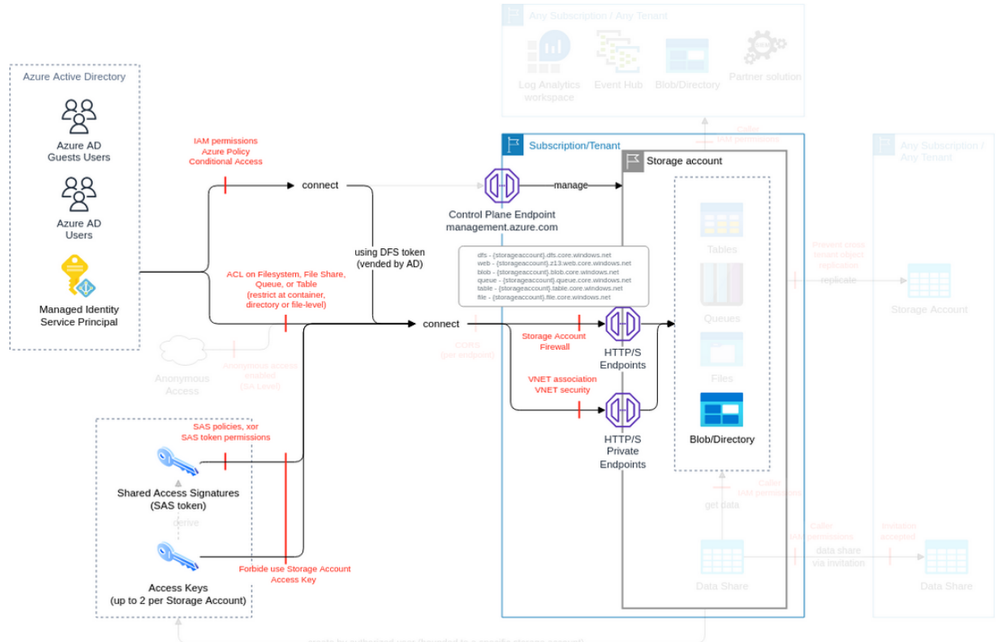


Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Limit the access to the IAM actions required to perform attacks using Azure IAM, following the IAM Operating Model and using the Azure IAM ThreatModel. Managed Identity is the preferred method for accessing data Lake storage Gen2 from parent services. Block the usage of storage account access key, whenever possible.	Very High	2	1	-
Enable storage accounts monitoring & notifications Maintain a list of directories and blobs that do not need modification after uploading to DFS/blob.	Very High	1	-	-
Scan input/output objects for malware If the storage account is used as an input or the output of a process, scan the objects for malware (e.g. using VirusScan)	High	-	1	-
Identify and ensure the protection all storage accounts hosting your objects Ensure SAS tokens allow only authorized IPs, using the sourceIP field and enforcing HTTPS. Use immutable blobs.	High	2	-	-
Connect via private endpoint Maintain a list of authorized VNETs for the blob, file shares, queues, tables, DFS access via private endpoint.	High	2	1	-

Ensure only authorized VNET are configured for the blob, file shares, queues, tables, DFS. Prevent the use of unauthorized VNETs by the storage account (e.g. by using Azure Policy).				
Block access to the endpoints Ensure traffic is denied from all networks including trusted services, logging and metrics read access, and allow traffic only from authorized list (ref).	Medium	1	-	-
Protect primary data against loss Ensure corporate backup policies are implemented for the blob, file shares, queues, tables, DFS, including regular testing.	Medium	1	-	-
Enable soft-delete on containers, blobs, and file shares For each storage account (or type of data), define the minimum retention of container and blob from the deletion (e.g. 7 days) Ensure storage accounts have soft-delete for the blob enabled for at least the defined minimum retention Ensure storage accounts have soft-delete for the container enabled Ensure storage accounts have soft-delete for the blob enabled Ensure storage accounts have soft-delete for the container enabled	Medium	5	-	-

Unauthorised modification of data

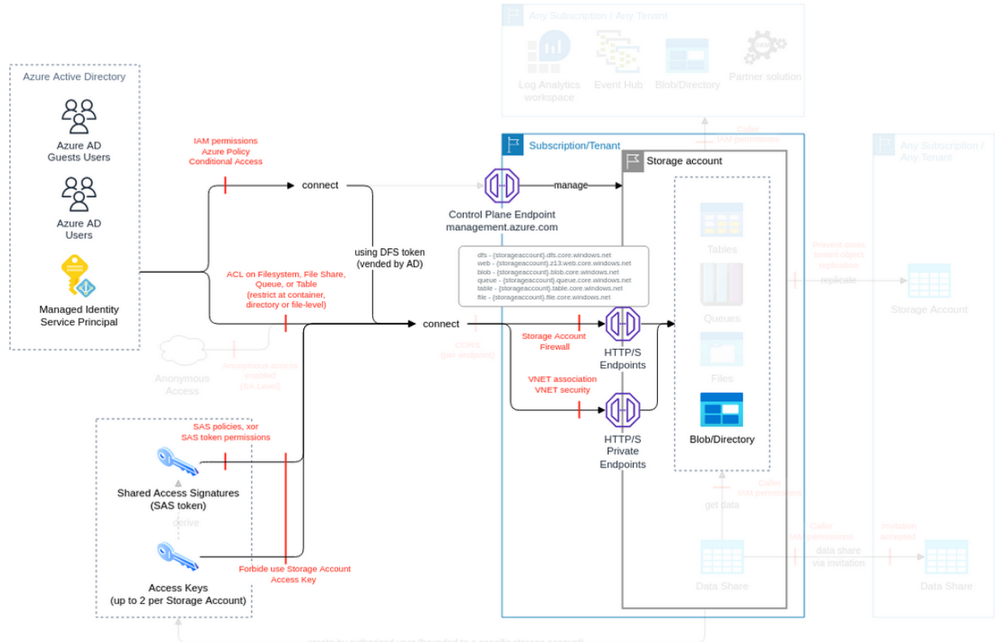
Threat Id	Storage.T8
Name	Unauthorised modification of data
Description	Common scenario for data Lake storage Gen2 is that incoming data after uploading to blob storage should not be modified. An attacker can modify data that can cause inconsistency in dependent subsystems.
Goal	Data manipulation
MITRE ATT&CK®	TA0040
CVSS	Medium (5.2)
IAM Access	{ "UNIQUE": "Microsoft.Storage/storageAccounts/blobServices/containers/blobs/write" }



Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Limit the access to the IAM actions required to perform attacks using Azure IAM, following the IAM Operating Model and using the Azure IAM ThreatModel. Maintain a list of authorized Groups to use in permissions for data Lake storage Gen2.	Very High	2	-	-
Enable storage accounts monitoring & notifications Maintain a list of directories and blobs that do not need modification after uploading to DFS/blob. Define a diagnostic settings design for storage accounts including destination (tenant/subscription), categories (ideally all) and rotation, based on requirement. Resource logs are not collected by default. You must create a diagnostic setting for each Azure resource to send its resource logs to a Log Analytics workspace to use with Azure Monitor Logs, Azure Event Hubs to forward outside of Azure, or to Azure storage for archiving. Ensure diagnostic settings are configured properly to the architecture design. Ensure storage accounts have diagnostic settings configured according to the design.	Very High	3	1	-
Identify and ensure the protection all storage accounts hosting your objects Use immutable blobs.	Very High	1	-	-

Recursively delete DFS directories and their content

Threat Id	Storage.T7
Name	Recursively delete DFS directories and their content
Description	DFS has a hierarchical architecture. An attacker can potentially delete multiple directories and files recursively to make them unavailable.
Goal	Disruption of Service
MITRE ATT&CK®	TA0040
CVSS	Medium (4.5)
IAM Access	{ "UNIQUE": ["Microsoft.Storage/storageAccounts/blobServices/containers/blobs/delete"] }



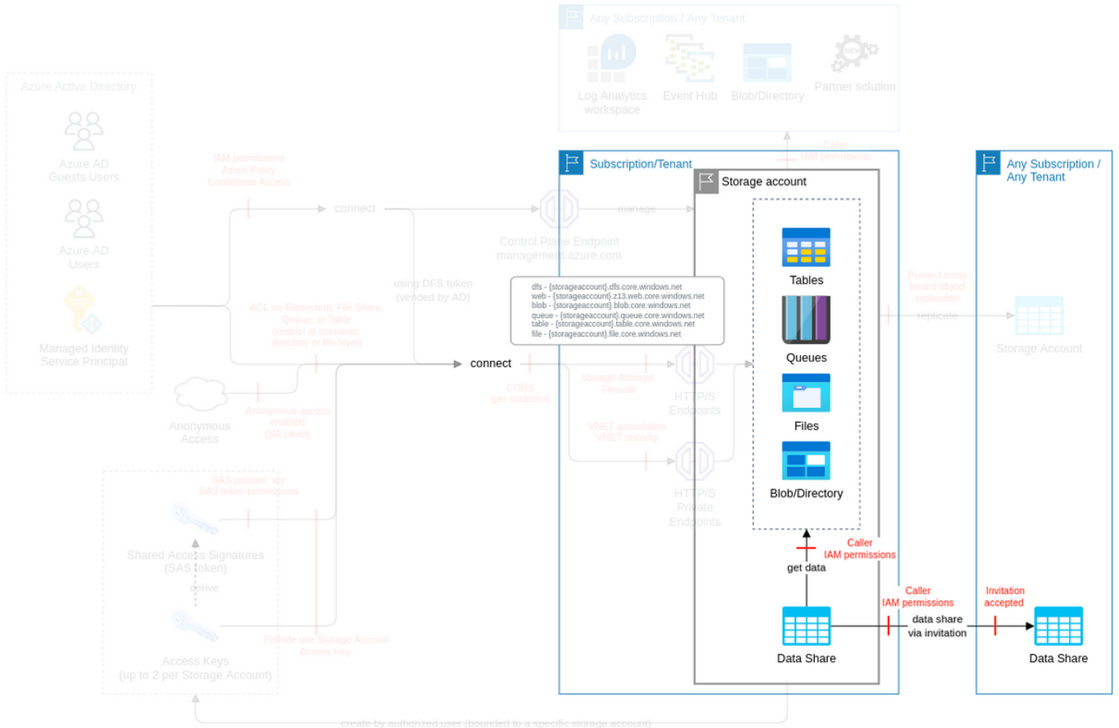
Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Limit the access to the IAM actions required to perform attacks using Azure IAM, following the IAM Operating Model and using the Azure IAM ThreatModel. Maintain a list of authorized Groups to use in permissions for data Lake storage Gen2. Ensure only authorized Groups are used in ACLs for data Lake storage Gen2. Use name convention for Groups adding Suffix R/RW and Entity to be used. Maintain an architecture of data Lake storage Gen2 ACL vs IAM based on requirements. Microsoft recommends using Azure Active Directory (Azure AD) to authorize requests against blob and queue data, if possible, instead of Shared Key. Azure AD provides superior security and ease of use over Shared Key. Integrate the access to directories and objects via ACL in the IAM Operating Model, not mixing IAM and ACL access method.	Very High	6	-	-
Enable storage accounts monitoring & notifications Maintain a list of directories and blobs that do not need modification after uploading to DFS/blob. Define a diagnostic settings design for storage accounts including destination (tenant/subscription), categories (ideally all) and rotation, based on requirement. Resource logs are not collected by default. You must create a diagnostic setting for each Azure resource to send its resource logs to a Log Analytics workspace to use with Azure Monitor Logs, Azure Event Hubs to forward outside of Azure, or to Azure storage for archiving. Ensure diagnostic settings are configured properly to the architecture design. Ensure storage accounts have diagnostic settings configured according to the design.	Very High	3	1	-

Integrate ACLs in the IAM Operating Model to allow non-AD access files and directories Integrate the access to files and directories via ACL in the IAM Operating Model	Very High	1	-	-
Protect primary data against loss Enable versioning on blobs holding primary data Backup primary data in a location which have different security authority (ref 1, ref 2) Ensure corporate backup policies are implemented for the blob, file shares, queues, tables, DFS, including regular testing.	Medium	3	-	-
Enable soft-delete on containers, blobs, and file shares For each storage account (or type of data), define the minimum retention of container and blob from the deletion (e.g. 7 days) Ensure storage accounts have soft-delete for the blob enabled for at least the defined minimum retention Ensure storage accounts have soft-delete for the container enabled Ensure storage accounts have soft-delete for the blob enabled Ensure storage accounts have soft-delete for the container enabled	Medium	5	-	-
Enable hierarchical namespace in storage account, only when required Maintain a list of authorized storage accounts with hierarchical namespace (DFS) option enabled. Ensure only authorized storage accounts with hierarchical namespace (DFS) option enabled are configured	Low	2	-	-

Blob inventory *(subclass of Blob storage, containers, data Lake storage Gen2, FC10)*

The Azure storage blob inventory feature provides an overview of your containers, blobs, snapshots, and blob versions within a storage account. Use the inventory report to understand various attributes of blobs and containers such as your total data size, age, encryption status, immutability policy, or legal hold.

Data Flow Diagram (DFD)



Actions and IAM Permissions to deny the feature

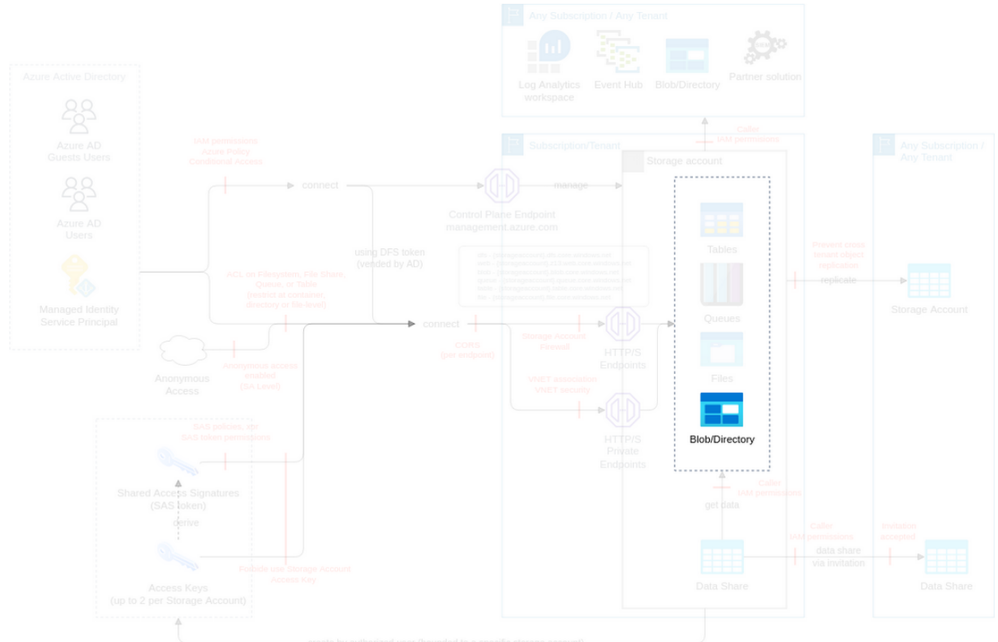
Action	IAM Permission
Policies write	Microsoft.Storage/storageAccounts/inventoryPolicies/write

Threat List

Name	CVSS
Exfiltrate data using blob inventory functionality	Medium (4.5)

Exfiltrate data using blob inventory functionality

Threat Id	Storage.T24
Name	Exfiltrate data using blob inventory functionality
Description	An attacker can setup/modify and get access to blob inventory and in that way get knowledge about running services and exfiltrate data.
Goal	Data theft
MITRE ATT&CK®	TA0010
CVSS	Medium (4.5)
IAM Access	{ "OR": ["Microsoft.Storage/storageAccounts/inventoryPolicies/read", "Microsoft.Storage/storageAccounts/inventoryPolicies/write", "Microsoft.Storage/storageAccounts/inventoryPolicies/delete"] }

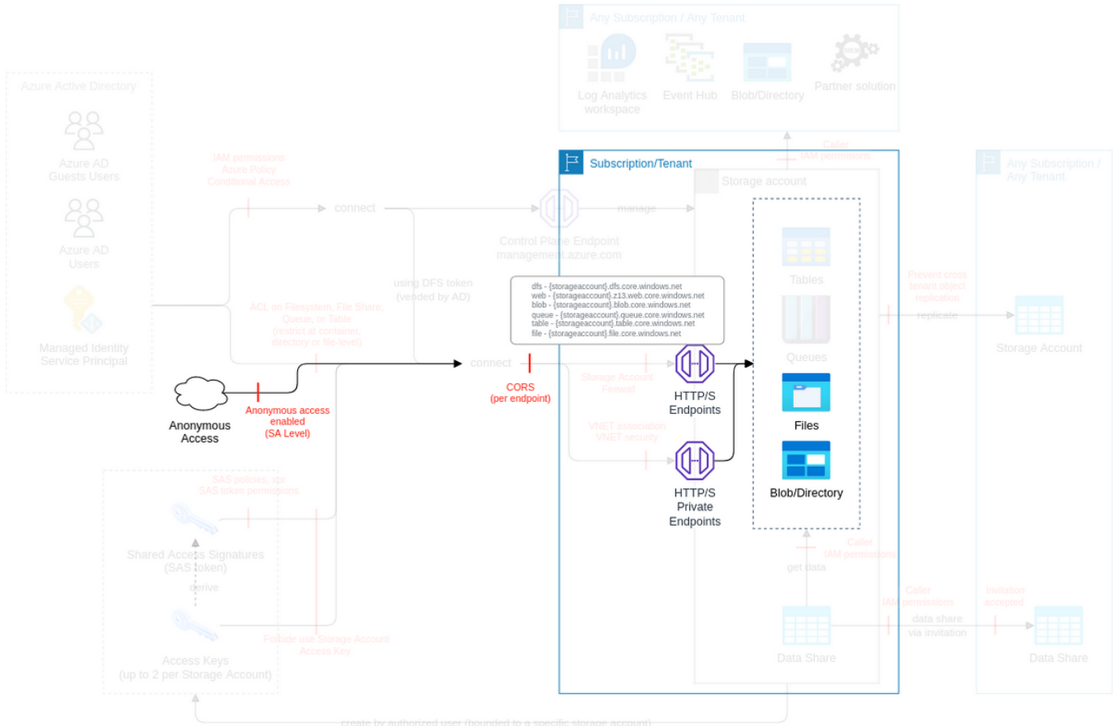


Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Limit the access to the IAM actions required to perform attacks using Azure IAM, following the IAM Operating Model and using the Azure IAM ThreatModel.	Very High	1	-	-

Blob lifecycle *(subclass of Blob storage, containers, data Lake storage Gen2, FC6)*

Azure blob storage lifecycle management offers a rich, rule-based policy which you can use to transition your data to the best access tier and to expire data at the end of its lifecycle.

Data Flow Diagram (DFD)



Actions and IAM Permissions to deny the feature

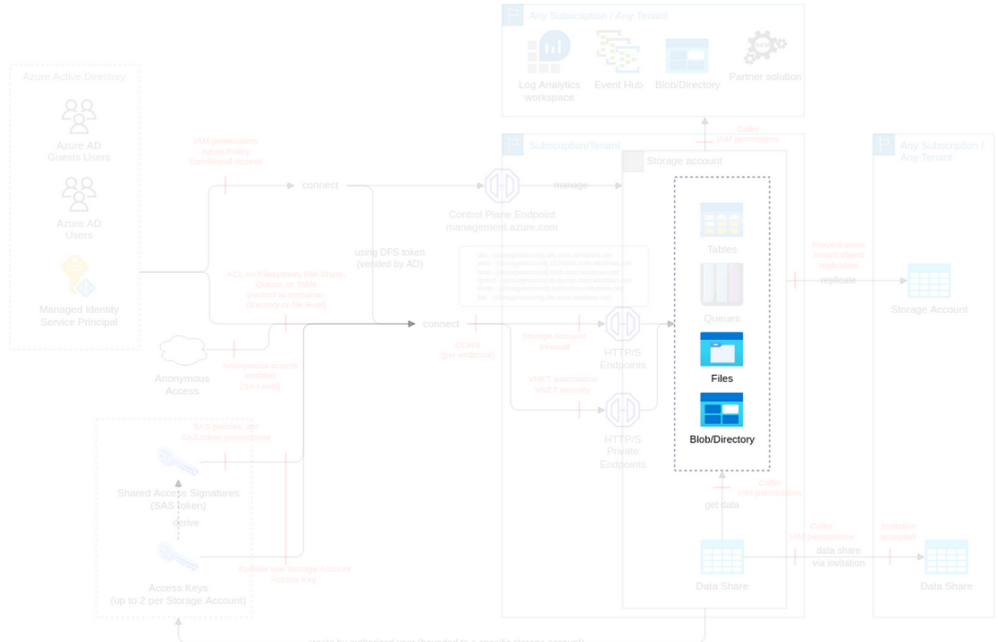
Action	IAM Permission
Set blob container legal hold	Microsoft.Storage/storageAccounts/blobServices/containers/setLegalHold/action
Put blob container immutability policy	Microsoft.Storage/storageAccounts/blobServices/containers/immutabilityPolicies/write

Threat List

Name	CVSS
Recursively delete data using blob storage lifecycle management	Medium (5.2)

Recursively delete data using blob storage lifecycle management

Threat Id	Storage.T25
Name	Recursively delete data using blob storage lifecycle management
Description	An attacker can setup/modify blob storage lifecycle management and in that way delete data, even after a time.
Goal	Data manipulation
MITRE ATT&CK®	TA0040
CVSS	Medium (5.2)
IAM Access	{ "OR": ["Microsoft.Storage/storageAccounts/blobServices/containers/clearLegalHold/action", "Microsoft.Storage/storageAccounts/blobServices/containers/setLegalHold/action", "Microsoft.Storage/storageAccounts/blobServices/containers/immutabilityPolicies/extend/action", "Microsoft.Storage/storageAccounts/blobServices/containers/immutabilityPolicies/delete", "Microsoft.Storage/storageAccounts/blobServices/containers/immutabilityPolicies/write", "Microsoft.Storage/storageAccounts/blobServices/containers/immutabilityPolicies/lock/action", "Microsoft.Storage/storageAccounts/blobServices/containers/immutabilityPolicies/read"] }



Control Objectives	Priority	# of associated Controls		
		Directive	Preventative	Detective
Limit the IAM entities allowed to execute the IAM actions required to perform attacks Limit the access to the IAM actions required to perform attacks using Azure IAM, following the IAM Operating Model and using the Azure IAM ThreatModel.	Very High	1	-	-
Enable soft-delete on containers, blobs, and file shares Ensure storage accounts have soft-delete for the blob enabled Prevent the creation of storage accounts without soft-delete for the blob option (e.g. by using an Azure Policy "Microsoft.storage/storageaccounts/deleteRetentionPolicy" in deny mode). Ensure storage accounts have soft-delete for the container enabled Prevent the creation of storage accounts without soft-delete for the container option (e.g. by using an Azure Policy in deny mode).	Medium	2	2	-

Control Implementation

Limit the IAM entities allowed to execute the IAM actions required to perform attacks [Storage.CO1]

Type	Control	Testing	Effort	Feature Class(es)	Threat(s) and Impact	CVSS-weighted Priority
Directive (COSO) Protect (NIST CSF)	[Storage.C1] Limit the access to the IAM actions required to perform attacks using Azure IAM, following the IAM Operating Model and using the Azure IAM ThreatModel.	Request the list of authorized IAM principals that have the permissions required to launch attacks, its review process, and its review records.	Medium	Storage.FC1 Storage.FC10 Storage.FC2 Storage.FC4 Storage.FC6 Storage.FC7	Storage.T1 (Medium) Storage.T2 (Medium) Storage.T4 (Medium) Storage.T5 (Medium) Storage.T6 (Medium) Storage.T7 (Medium) Storage.T8 (Medium) Storage.T9 (Medium) Storage.T12 (Medium) Storage.T23 (High) Storage.T24 (Medium) Storage.T25 (Medium) Storage.T31 (Low) Storage.T32 (Low)	Very High
Preventative (COSO) Protect (NIST CSF)	[Storage.C23] Limit access to delete storage accounts, via Azure Policy and IAM. Do not ever delete a sensitive storage account (e.g. just delete all data) to make sure that storage account FQDN cannot be used as a source of attacks.	Try to delete storage account, it should be denied	Medium	Storage.FC2	Storage.T5 (Very High)	Very High
Directive (COSO) Identify (NIST CSF)	[Storage.C27] Maintain a list of authorized Groups to use in permissions for data Lake storage Gen2.	Request the list of authorized Groups, its review process, and its review records.	Very Low	Storage.FC2 Storage.FC3	Storage.T6 (Very Low) Storage.T7 (Very Low) Storage.T8 (Very Low) Storage.T15 (Very Low) Storage.T30 (Very Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C28, depends on Storage.C27] Ensure only authorized Groups are used in ACLs for data Lake storage Gen2.	Review ACLs against usage of individual users' service principal.	Low	Storage.FC2 Storage.FC3 Storage.FC7	Storage.T1 (Very Low) Storage.T2 (Very Low) Storage.T7 (High) Storage.T9 (Very Low) Storage.T15 (Low) Storage.T30 (Low)	High
Directive (COSO) Protect (NIST CSF)	[Storage.C29, depends on Storage.C27] Use name convention for Groups adding Suffix R/RW and Entity to be used.	Review Group-Name convention.	Medium	Storage.FC2 Storage.FC3 Storage.FC7	Storage.T1 (Very Low) Storage.T2 (Very Low) Storage.T7 (High) Storage.T9 (Very Low) Storage.T15 (Low) Storage.T30 (Low)	Medium

Directive (COSO) Identify (NIST CSF)	[Storage.C32] Maintain an architecture of data Lake storage Gen2 ACL vs IAM based on requirements. Microsoft recommends using Azure Active Directory (Azure AD) to authorize requests against blob and queue data, if possible, instead of Shared Key. Azure AD provides superior security and ease of use over Shared Key.	Check documentation.	Medium	Storage.FC2	Storage.T6 (Very Low) Storage.T7 (Very Low) Storage.T9 (Very Low)	Very Low
Directive (COSO) Protect (NIST CSF)	[Storage.C33, depends on Storage.C32] Integrate the access to directories and objects via ACL in the IAM Operating Model, not mixing IAM and ACL access method.	Request the IAM operating model for the directories and objects.	Low	Storage.FC2 Storage.FC3	Storage.T6 (Very Low) Storage.T7 (High) Storage.T9 (High) Storage.T15 (Very Low) Storage.T30 (Very Low)	High
Directive (COSO) Protect (NIST CSF)	[Storage.C44] Managed Identity is the preferred method for accessing data Lake storage Gen2 from parent services.	Check if underlying services are not using SAS, or other password methods to authenticate.	Medium	Storage.FC2 Storage.FC7	Storage.T2 (Very Low) Storage.T3 (Very Low) Storage.T12 (High)	Medium
Corrective (COSO) Protect (NIST CSF)	[Storage.C81] Integrate the access to blob, file shares, queues, tables and DFS via SAS token in the IAM Operating Model, ideally prioritising AD as preferred method.	Check if (Azure) Active Directory is used for assigning permissions.	Medium	Storage.FC3 Storage.FC4 Storage.FC5 Storage.FC7	Storage.T1 (Low) Storage.T3 (Low) Storage.T16 (Very Low) Storage.T17 (Low) Storage.T18 (Low) Storage.T19 (Low) Storage.T27 (Low) Storage.T28 (Low)	Medium
Preventative (COSO) Protect (NIST CSF)	[Storage.C82, assured by Storage.C83] Block the usage of storage account access key, whenever possible.	Try to connect using storage account access keys - Expected error "key based authentication is not permitted on this storage account", it should be denied.	Medium	Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC5 Storage.FC7	Storage.T1 (Very High) Storage.T2 (Very High) Storage.T3 (Very High) Storage.T9 (Very Low) Storage.T12 (Very High) Storage.T16 (Very Low) Storage.T17 (Low) Storage.T27 (Low) Storage.T28 (Low)	Very High
Assurance (COSO) Detect (NIST CSF)	[Storage.C83] Verify only authorized authorization method set for authorized blob, file shares, queues, tables, DFS (e.g. using Azure Policy on audit mode).	Configure a blob, file share, queue, table, or DFS with an unauthorized authorization method, it should be detected.	High	Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC5 Storage.FC7	-	Very High
Directive (COSO) Identify (NIST CSF)	[Storage.C89] Maintain a revocation plan for any SAS or storage account access keys that you issue to clients based on requirements. If a SAS is compromised, you need to revoke that SAS as soon as possible. To revoke a user delegation SAS, revoke the user delegation key to	Request the of authorized revocation plan for any SAS or storage account access keys, its review process, and its review records.	Low	Storage.FC3 Storage.FC7	Storage.T1 (Very Low) Storage.T2 (Very Low) Storage.T3 (Very Low) Storage.T16 (Very Low)	Low

	quickly invalidate all signatures associated with that key. To revoke a service SAS that is associated with a stored access policy, you can delete the stored access policy, rename the policy, or change its expiry time to a time that is in the past (ref).					
Directive (COSO) Protect (NIST CSF)	[Storage.C90, depends on Storage.C89, assured by Storage.C91] Ensure the revocation plan is in place for any SAS or storage account access key.	Request 1) the mechanism ensuring revocation plan in place for any SAS or storage account access keys is in use, 2) its records of testing for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC3 Storage.FC7	Storage.T1 (Very Low) Storage.T2 (Low) Storage.T3 (Very Low) Storage.T16 (Very Low)	Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C91] Verify the revocation plan is in place for any SAS or storage account access key.	Check test executions. Any unsuccessful attempts, it should be detected	High	Storage.FC3 Storage.FC7	-	Low

Identify and ensure the protection all storage accounts hosting your objects [Storage.CO2]

Type	Control	Testing	Effort	Feature Class(es)	Threat(s) and Impact	CVSS-weighted Priority
Directive (COSO) Identify (NIST CSF)	[Storage.C2] Define an ACL or IAM authentication for every data Lake storage Gen2. Ideally use Azure AD only, and multiple DLS if fine-grained access is required.	Request the list of all storage accounts you control, define their authorized data classification, identify whether the data is primary and the mechanism and records to ensure the accuracy of those metadata	High	Storage.FC2 Storage.FC3	Storage.T5 (Very Low) Storage.T15 (Very Low) Storage.T30 (Very Low)	Medium
Detective (COSO) Detect (NIST CSF)	[Storage.C3, depends on Storage.C2] Use a data discovery tool to control that no sensitive data are stored in unauthorized storage account	Upload a higher classification data in a storage account, it should be detected.	Medium	Storage.FC2	Storage.T5 (Medium)	Medium
Detective (COSO) Detect (NIST CSF)	[Storage.C4] Use a data discovery tool to ensure the storage account names, object names, and tags do not contain sensitive data	Create 1) a storage account name, 2) object names, or 3) tags with sensitive data, it should be detected.	Very High	Storage.FC2	Storage.T5 (Medium)	Low
Directive (COSO) Identify (NIST CSF)	[Storage.C24] Maintain a list of authorized IPs to use SAS tokens, and their authorized time window.	Request the list of authorized IPs to use SAS tokens, its review process, and its review records.	Very Low	Storage.FC4 Storage.FC7	Storage.T3 (Very Low) Storage.T31 (Very Low) Storage.T32 (Very Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C25, depends on Storage.C24, assured by Storage.C26] Ensure SAS tokens allow only authorized IPs, using the sourceIP field and enforcing HTTPS.	Request 1) the mechanism ensuring SAS tokens allow only authorized IPs, 2) its records of execution for all new SAS tokens, and 3) plan to move any older SAS tokens.	Very Low	Storage.FC2 Storage.FC4 Storage.FC7	Storage.T1 (Low) Storage.T3 (Low) Storage.T9 (Very Low) Storage.T12 (Medium) Storage.T31 (Low) Storage.T32 (Low)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C26] Verify SAS tokens only allow authorized IPs.	Deploy a SAS token with an unauthorized IP, it should be detected	Medium	Storage.FC2 Storage.FC4 Storage.FC7	-	Medium

Directive (COSO) Protect (NIST CSF)	[Storage.C31, depends on Storage.C30] Use immutable blobs.	Check the usage of immutable blobs.	Medium	Storage.FC2	Storage.T8 (Very High) Storage.T9 (Very High) Storage.T12 (Medium)	High

Integrate ACLs in the IAM Operating Model to allow non-AD access files and directories [Storage.CO3]

Type	Control	Testing	Effort	Feature Class(es)	Threat(s) and Impact	CVSS-weighted Priority
Directive (COSO) Protect (NIST CSF)	[Storage.C5, depends on Storage.C1] Integrate the access to files and directories via ACL in the IAM Operating Model	Request the IAM operating model for the access to files and directories via ACL	Low	Storage.FC2 Storage.FC4	Storage.T7 (High) Storage.T9 (Very Low) Storage.T31 (Low) Storage.T32 (Low)	High

Ensure no storage account allow public access to blob [Storage.CO4]

Type	Control	Testing	Effort	Feature Class(es)	Threat(s) and Impact	CVSS-weighted Priority
Directive (COSO) Identify (NIST CSF)	[Storage.C6] Maintain a list of authorized storage accounts with allowblobPublicAccess enabled, ideally none	Request the list of authorized storage accounts with allowblobPublicAccess enabled, its review process, and its review records.	Low	Storage.FC2	Storage.T5 (Very Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C7, depends on Storage.C6, assured by Storage.C9] Ensure no storage accounts have allowblobPublicAccess enabled, except if authorized.	Request 1) the mechanism ensuring only authorized storage accounts have allowblobPublicAccess enabled, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC2 Storage.FC3	Storage.T5 (Medium) Storage.T15 (Very Low) Storage.T30 (Very Low)	Medium
Preventative (COSO) Protect (NIST CSF)	[Storage.C8, depends on Storage.C6] Prevent the creation/update of storage accounts with allowblobPublicAccess enabled (e.g. using Azure Policy on deny mode - "[Preview]: storage account public access should be disallowed").	Create a storage account with allowblobPublicAccess, it should be denied.	High	Storage.FC2 Storage.FC3	Storage.T5 (Medium) Storage.T6 (Medium) Storage.T15 (Very Low) Storage.T30 (Very Low)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C9] Verify no storage accounts have allowblobPublicAccess enabled (e.g. using Azure Policy on audit mode - "[Preview]: storage account public access should be disallowed").	Create a storage account with allowblobPublicAccess, it should be detected.	High	Storage.FC2 Storage.FC3	-	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C52] Verify storage accounts with cross-tenant replication enabled (e.g. using Azure Policy "storage accounts should prevent cross tenant object replication" in audit mode.).	Creation of storage account with cross-tenant option enabled, it should be detected.	Low	Storage.FC2 Storage.FC9	-	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C93, depends on Storage.C92, assured by Storage.C95] Ensure only authorized storage accounts has the static website hosting option enabled.	Request 1) the mechanism ensuring only authorized storage accounts has static website hosting option enabled, 2) its records of execution for all new storage	High	Storage.FC2	Storage.T22 (Medium)	Medium

		accounts, and 3) plan to move any older storage accounts				
Preventative (COSO) Protect (NIST CSF)	[Storage.C94, depends on Storage.C92] Prevent unauthorized storage accounts to have the static website hosting option enabled (e.g. using Azure Policy on deny mode).	Create a storage account with a static website hosting option enabled, it should be denied.	Very Low	Storage.FC2	Storage.T22 (Medium)	High
Assurance (COSO) Detect (NIST CSF)	[Storage.C95] Verify only authorized storage accounts has the static website hosting option enabled (e.g. using Azure Policy on audit mode).	Create a storage account with a static website hosting option enabled, it should be detected.	High	Storage.FC2	-	Medium

Protect primary data against loss [Storage.CO5]

Type	Control	Testing	Effort	Feature Class(es)	Threat(s) and Impact	CVSS-weighted Priority
Directive (COSO) Protect (NIST CSF)	[Storage.C10, assured by Storage.C11] Enable versioning on blobs holding primary data	Request the mechanism used to ensure versioning on blobs holding primary data, and its records	Medium	Storage.FC2	Storage.T7 (Low)	Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C11] Verify blobs holding primary data are versioned	Remove versioning from a blob holding primary data, it should be detected	High	Storage.FC2	-	Low
Directive (COSO) Recover (NIST CSF)	[Storage.C12] Backup primary data in a location which have different security authority (ref 1, ref 2)	Request the mechanism used to backup primary data in a location which have different security authority, its records of execution, and records of restoration testing	High	Storage.FC2 Storage.FC3	Storage.T7 (High) Storage.T17 (Low) Storage.T18 (Medium) Storage.T19 (Medium) Storage.T20 (Medium)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C49] Ensure corporate backup policies are implemented for the blob, file shares, queues, tables, DFS, including regular testing.	Request the backup policies for DFS, its review process, and its review records.	Low	Storage.FC2	Storage.T7 (Medium) Storage.T9 (Medium) Storage.T12 (Medium)	Medium
Directive (COSO) Identify (NIST CSF)	[Storage.C50] Maintain a list of objects with cross-tenant replication enabled.	Request the list of authorized objects use allow cross-tenant replication, its review process, and its review records.	Low	Storage.FC2 Storage.FC9	Storage.T5 (Very Low) Storage.T13 (Very Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C51, depends on Storage.C50, assured by Storage.C52] Ensure cross-tenant replication is allowed only for specific storage accounts.	Request 1) the mechanism ensuring allowblobPublicAccess allow only authorized blobs, 2) its records of execution for all new blobs.	High	Storage.FC2 Storage.FC9	Storage.T5 (High) Storage.T6 (High) Storage.T13 (High)	Medium
Directive (COSO) Identify (NIST CSF)	[Storage.C73] Maintain a list of authorized Azure storage redundancy options.	Request the list of authorized Azure storage redundancy, its review process, and its review records.	Low	Storage.FC1	Storage.T14 (Very Low)	Low
Directive (COSO) Protect (NIST CSF)	[Storage.C74, depends on Storage.C73, assured by Storage.C76] Ensure authorized Azure storage redundancy is set for authorized storage accounts.	Request 1) the mechanism ensuring only Azure storage redundancy for storage accounts are in use, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC1	Storage.T14 (Very Low)	Very Low

Preventative (COSO) Protect (NIST CSF)	[Storage.C75, depends on Storage.C73] Ensure only authorized Azure storage redundancy is set for authorized storage accounts (e.g. using Azure Policy in deny mode).	Create a blob with unauthorized Azure storage redundancy for Azure storage, it should be denied.	Very Low	Storage.FC1	Storage.T14 (Very Low)	Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C76] Verify only authorized Azure storage redundancy is set for authorized storage accounts (e.g. using Azure Policy on audit mode).	Configure a storage account with an unauthorized redundancy settings, it should be detected.	High	Storage.FC1	-	Very Low
Directive (COSO) Identify (NIST CSF)	[Storage.C111] Maintain a list of authorized storage and corresponding accounts locks.	Request the list of authorized storage accounts locks settings, its review process, and its review records.	Very Low	Storage.FC2	Storage.T5 (Very Low)	Very High
Directive (COSO) Protect (NIST CSF)	[Storage.C112, depends on Storage.C111, assured by Storage.C113] Lock storage account to prevent accidental or malicious deletion or configuration changes and ensure only authorized storage accounts have lock disabled.	Request 1) the mechanism ensuring only authorized storage accounts have locks disabled, 2) its records of execution for all new storage accounts locks, and 3) plan to move any older storage accounts	Very Low	Storage.FC2	Storage.T5 (High)	Very High
Assurance (COSO) Detect (NIST CSF)	[Storage.C113] Verify the creation/update of storage accounts lock and corresponding settings (e.g. using activity logs "localized Value": "Delete management locks").	Delete a storage account lock, it should be detected.	Very Low	Storage.FC2	-	Very High

Enable soft-delete on containers, blobs, and file shares [Storage.CO6]

Type	Control	Testing	Effort	Feature Class(es)	Threat(s) and Impact	CVSS-weighted Priority
Directive (COSO) Identify (NIST CSF)	[Storage.C13] For each storage account (or type of data), define the minimum retention of container and blob from the deletion (e.g. 7 days)	For each storage account, request the minimum retention of container and blob from the deletion, its review process, and its review records	Low	Storage.FC2	Storage.T7 (Very Low) Storage.T9 (Very Low) Storage.T12 (Very Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C14, depends on Storage.C13, assured by Storage.C16] Ensure storage accounts have soft-delete for the blob enabled for at least the defined minimum retention	Request 1) the mechanism ensuring storage accounts have soft-delete for the blob enabled for at least the defined minimum retention, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	Low	Storage.FC2	Storage.T7 (Very Low) Storage.T9 (Very Low) Storage.T12 (Very Low)	Very Low
Preventative (COSO) Protect (NIST CSF)	[Storage.C15, depends on Storage.C13] Prevent the creation of storage accounts without soft-delete for the blob option (e.g. by using an Azure Policy in deny mode).	Create a storage account without soft-delete for the blob, it should be denied	High	Storage.FC2	Storage.T9 (High)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C16] Verify all storage accounts have soft-delete for the blob enabled (e.g. by using an Azure Policy in audit mode).	Create a storage account without soft-delete for the blob option, it should be detected.	Low	Storage.FC2	-	Very Low

Directive (COSO) Protect (NIST CSF)	[Storage.C17, depends on Storage.C13, assured by Storage.C19] Ensure storage accounts have soft-delete for the container enabled	Request 1) the mechanism ensuring storage accounts have soft-delete for the container enabled, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	Medium	Storage.FC2	Storage.T7 (Very Low) Storage.T9 (Very Low) Storage.T12 (Very Low)	Very Low
Preventative (COSO) Protect (NIST CSF)	[Storage.C18, depends on Storage.C13] Prevent the creation of storage accounts without soft-delete for the container option (e.g. by using an Azure Policy in deny mode).	Create a storage account without soft-delete for the container, it should be denied.	High	Storage.FC2	Storage.T9 (High)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C19] Verify storage accounts without soft-delete for the container are not configured.	Create a storage account without soft-delete for the container option, it should be detected.	Low	Storage.FC2	-	Very Low
Directive (COSO) Protect (NIST CSF)	[Storage.C34, assured by Storage.C36] Ensure storage accounts have soft-delete for the blob enabled	Request 1) the mechanism ensuring storage accounts have soft-delete for the blob enabled, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC2 Storage.FC6	Storage.T6 (Very Low) Storage.T7 (Very Low) Storage.T9 (Very Low) Storage.T12 (Very Low) Storage.T25 (Low)	Medium
Preventative (COSO) Protect (NIST CSF)	[Storage.C35] Prevent the creation of storage accounts without soft-delete for the blob option (e.g. by using an Azure Policy "Microsoft.storage/storageaccounts/deleteRetentionPolicy" in deny mode).	Create a storage account without soft-delete for the blob, it should be denied	High	Storage.FC2 Storage.FC6	Storage.T9 (High) Storage.T25 (Low)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C36] Verify all storage accounts have soft-delete for the blob enabled	Create a storage account without soft-delete for the blob option, it should be detected.	Low	Storage.FC2 Storage.FC6	-	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C37, assured by Storage.C39] Ensure storage accounts have soft-delete for the container enabled	Request 1) the mechanism ensuring storage accounts have soft-delete for the container enabled, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	Medium	Storage.FC2 Storage.FC6	Storage.T7 (Very Low) Storage.T9 (Very Low) Storage.T12 (Very Low) Storage.T25 (Low)	Low
Preventative (COSO) Protect (NIST CSF)	[Storage.C38, depends on Storage.C34] Prevent the creation of storage accounts without soft-delete for the container option (e.g. by using an Azure Policy in deny mode).	Create a storage account without soft-delete for the container, it should be denied.	High	Storage.FC2 Storage.FC6	Storage.T9 (High) Storage.T25 (Low)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C39] Verify storage accounts without soft-delete for the container are not configured.	Create a storage account without soft-delete for the container option, it should be detected.	Low	Storage.FC2 Storage.FC6	-	Low
Directive (COSO) Identify (NIST CSF)	[Storage.C58] Maintain a list of authorized blob and containers with public access level set to anonymous, ideally none	Request the list of authorized blob and containers with public access level set to anonymous, its review process, and its review records.	Low	Storage.FC2	Storage.T5 (Very Low) Storage.T6 (Very Low)	High
Directive (COSO) Protect (NIST CSF)	[Storage.C59, depends on Storage.C58, assured by Storage.C62] Ensure anonymous access level is set only for authorized blobs / containers.	Request 1) the mechanism ensuring only authorized blob / container are anonymously accessed, 2) its	High	Storage.FC2	Storage.T5 (Medium) Storage.T6 (Low)	Medium

		records of execution for all new storage accounts, and 3) plan to move any older storage accounts				
Preventative (COSO) Protect (NIST CSF)	[Storage.C60, depends on Storage.C58] Ensure only authorized blob and containers are anonymously accessed (e.g. using Azure Policy in deny mode).	Create a blob, or a container anonymously accessible, it should be denied.	Very Low	Storage.FC2	Storage.T5 (Medium) Storage.T6 (Low)	High
Detective (COSO) Detect (NIST CSF)	[Storage.C61] Monitor the creation/update of blob and containers that are anonymously accessed (e.g. using Azure Automations).	Create a blob, or a container anonymously accessible, it should be detected.	Low	Storage.FC2	Storage.T5 (Medium) Storage.T6 (Low)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C62] Verify only authorized blob or containers are anonymously accessible (e.g. using Azure Policy on audit mode).	Create 1) a blob, or 2) a container anonymously accessible, it should be detected.	High	Storage.FC2	-	Medium
Directive (COSO) Identify (NIST CSF)	[Storage.C85] For each file share, define the minimum retention of container and blob from the deletion (e.g. 7 days)	For each file share, request the minimum retention from the deletion, its review process, and its review records	High	Storage.FC3	Storage.T18 (Very Low) Storage.T19 (Very Low) Storage.T20 (Very Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C86, depends on Storage.C85, assured by Storage.C88] Ensure file shares have soft-delete enabled for at least the defined minimum retention	Request 1) the mechanism ensuring file shares have soft-delete enabled for at least the defined minimum retention, 2) it's records of execution for all new file shares, and 3) plan to move any older file shares	Low	Storage.FC3	Storage.T18 (Medium) Storage.T19 (Very Low) Storage.T20 (Very Low)	Medium
Preventative (COSO) Protect (NIST CSF)	[Storage.C87, depends on Storage.C85] Prevent the creation of file shares without soft-delete (e.g. by using an Azure Policy in deny mode).	Create a file share without soft-delete, it should be denied	High	Storage.FC3	Storage.T18 (Medium) Storage.T19 (Very Low) Storage.T20 (Very Low)	Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C88] Verify all file shares have soft-delete (e.g. by using an Azure Policy in audit mode).	Create a file share without soft-delete , it should be detected.	Low	Storage.FC3	-	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C105, assured by Storage.C107] Ensure storage accounts have Azure Defender for Storage account enabled" with "Ensure storage accounts have Azure Defender for storage account enabled	Request 1) the mechanism ensuring storage accounts have Azure Defender for storage account enabled, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC2 Storage.FC3 Storage.FC7	Storage.T2 (Very Low) Storage.T3 (Very Low) Storage.T5 (Very Low) Storage.T20 (Very Low)	Low
Preventative (COSO) Protect (NIST CSF)	[Storage.C106] Prevent the creation of storage accounts without Azure Defender for storage account option (e.g. by using an Azure Policy "Microsoft.storage/storageaccounts/deleteRetentionPolicy" in deny mode).	Create a storage account without Azure Defender for storage account, it should be denied	High	Storage.FC2 Storage.FC3 Storage.FC7	Storage.T2 (Very Low) Storage.T3 (Very Low) Storage.T5 (Low) Storage.T20 (Medium)	Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C107] Verify all storage accounts have Azure Defender for storage account enabled	Create a storage account without Azure Defender for storage account option, it should be detected.	Low	Storage.FC2 Storage.FC3 Storage.FC7	-	Low

Directive (COSO) Protect (NIST CSF)	[Storage.C108, assured by Storage.C110] Ensure storage accounts have Azure Defender enabled	Request 1) the mechanism ensuring storage accounts have Azure Defender for storage account enabled, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	Medium	Storage.FC2 Storage.FC3 Storage.FC7	Storage.T2 (Very Low) Storage.T3 (Very Low) Storage.T5 (Low) Storage.T20 (Medium)	Medium
Preventative (COSO) Protect (NIST CSF)	[Storage.C109, depends on Storage.C105] Prevent the creation of storage accounts without Azure Defender (e.g. by using an Azure Policy in deny mode).	Create a storage account without Azure Defender for storage account, it should be denied.	High	Storage.FC2 Storage.FC3 Storage.FC7	Storage.T2 (Very Low) Storage.T3 (Very Low) Storage.T5 (Very Low) Storage.T20 (Very Low)	Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C110] Verify storage accounts without Azure Defender for storage account enabled.	Create a storage account without Azure Defender for storage account, it should be detected.	Low	Storage.FC2 Storage.FC3 Storage.FC7	-	Medium

Enable hierarchical namespace in storage account, only when required [Storage.CO7]

Type	Control	Testing	Effort	Feature Class(es)	Threat(s) and Impact	CVSS-weighted Priority
Directive (COSO) Identify (NIST CSF)	[Storage.C20] Maintain a list of authorized storage accounts with hierarchical namespace (DFS) option enabled.	Request the list of authorized {resources}, its review process, and its review records	Medium	Storage.FC2	Storage.T6 (Very Low) Storage.T7 (Very Low) Storage.T30 (Very Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C21, depends on Storage.C20, assured by Storage.C22] Ensure only authorized storage accounts with hierarchical namespace (DFS) option enabled are configured	Request 1) the mechanism ensuring only authorized storage accounts with hierarchical namespace (DFS) option enabled are configured, 2) its records of execution for all new storage accounts with hierarchical namespace (DFS) option enabled and 3) plan to move any older storage accounts with hierarchical namespace (DFS) option enabled.	Medium	Storage.FC2	Storage.T6 (Low) Storage.T7 (Low) Storage.T30 (Low)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C22] Verify storage accounts with hierarchical namespace (DFS) option enabled are not configured (e.g. by using an Azure Policy {"isHnsEnabled": "true"} in audit mode)	Create a storage account with hierarchical namespace (DFS) option enabled, it should be detected	Medium	Storage.FC2	-	Medium

Enforce encryption-in-transit [Storage.CO8]

Type	Control	Testing	Effort	Feature Class(es)	Threat(s) and Impact	CVSS-weighted Priority
Assurance (COSO) Detect (NIST CSF)	[Storage.C67] Verify only authorized keys for Azure storage encryption with desired assignment and rotation policy are in use (e.g. using Azure Policy on audit mode).	Configure a storage account with an unauthorized encryption settings, it should be detected.	High	Storage.FC1	-	Low
Directive (COSO) Identify (NIST CSF)	[Storage.C68]	Request the list of authorized encryption in transit methods, its review process, and its review records.	Very Low	Storage.FC1 Storage.FC3	Storage.T11 (Very Low) Storage.T21 (Very Low)	Very High

	Maintain a list of authorized encryption in transit methods with desired assignment to storage accounts. Ideally minimum TLS 1.2.					
Directive (COSO) Protect (NIST CSF)	[Storage.C69, depends on Storage.C68, assured by Storage.C72] Ensure authorized encryption in transit methods with desired assignment is set for authorized storage accounts.	Request 1) the mechanism ensuring only encryption in transit methods with desired assignment are in use, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	Low	Storage.FC1 Storage.FC3	Storage.T11 (High) Storage.T21 (Medium)	Very High
Preventative (COSO) Protect (NIST CSF)	[Storage.C70, depends on Storage.C68] Ensure storage accounts have authorized encryption in transit methods configured (e.g. using Azure Policy in deny mode).	Create a blob with unauthorized encryption in transit methods for Azure storage, it should be denied.	Medium	Storage.FC1 Storage.FC3	Storage.T11 (Very High) Storage.T21 (Medium)	Very High
Detective (COSO) Detect (NIST CSF)	[Storage.C71] Monitor the creation/update usage encryption in transit methods with desired assignment is set for authorized storage accounts (e.g. using activity logs on properties.supportsHttpsTrafficOnly scope "supportsHttpsTrafficOnly").	Configure a storage account with an unauthorized encryption in transit settings, it should be detected.	Low	Storage.FC1 Storage.FC3	Storage.T11 (Medium) Storage.T21 (Medium)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C72] Verify only authorized encryption in transit methods with desired assignment is set for authorized storage accounts (e.g. using Azure Policy on audit mode).	Configure a storage account with an unauthorized encryption in transit settings, it should be detected.	Low	Storage.FC1 Storage.FC3	-	Very High
Directive (COSO) Identify (NIST CSF)	[Storage.C100] Maintain a list of authorized SMB 2.1 Azure Files.	Request the list of authorized SMB 2.1 Azure Files with SMB 2.1 settings, its review process, and its review records.	Low	Storage.FC3	Storage.T21 (Very Low)	Low
Directive (COSO) Protect (NIST CSF)	[Storage.C101, depends on Storage.C100, assured by Storage.C104] Ensure only authorized Azure Files SMB 2.1 have encryption disabled.	Request 1) the mechanism ensuring only authorized SMB 2.1 Azure Files have encryption disabled, 2) its records of execution for all new SMB 2.1 Azure Files, and 3) plan to move any older storage accounts	High	Storage.FC3	Storage.T21 (Low)	Low
Preventative (COSO) Protect (NIST CSF)	[Storage.C102, depends on Storage.C100] Prevent unauthorized Azure Files SMB 2.1 to have encryption disabled (e.g. using Azure Policy in deny mode).	Create a storage account with encryption disabled, it should be denied.	High	Storage.FC3	Storage.T21 (Low)	Low
Detective (COSO) Detect (NIST CSF)	[Storage.C103] Monitor the creation/update of Azure Files SMB 2.1 and corresponding settings (e.g. using activity logs on properties.supportsHttpsTrafficOnly scope "supportsHttpsTrafficOnly").	Create a storage account with encryption disabled, it should be detected.	High	Storage.FC3	Storage.T21 (Low)	Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C104] Verify only authorized Azure Files SMB 2.1 and corresponding settings are configured (e.g. using Azure Policy on audit mode).	Create a storage account with encryption disabled, it should be detected.	High	Storage.FC3	-	Low

Connect via private endpoint [Storage.CO9]

Type	Control	Testing	Effort	Feature Class(es)	Threat(s) and Impact	CVSS-weighted Priority
Directive (COSO) Identify (NIST CSF)	[Storage.C40] Maintain a list of authorized VNETs for the blob, file shares, queues, tables, DFS access via private endpoint.	Request the list of authorized IPs, its review process, and its review records.	Low	Storage.FC1 Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC7	Storage.T2 (Very Low) Storage.T3 (Very Low) Storage.T5 (Very Low) Storage.T6 (Very Low) Storage.T9 (Very Low) Storage.T11 (Very Low) Storage.T12 (Very Low) Storage.T15 (Very Low) Storage.T29 (Very Low) Storage.T30 (Very Low) Storage.T31 (Very Low) Storage.T32 (Very Low)	High
Directive (COSO) Protect (NIST CSF)	[Storage.C41, depends on Storage.C40, assured by Storage.C43] Ensure only authorized VNET are configured for the blob, file shares, queues, tables, DFS.	Request 1) the mechanism ensuring PE are in place 2) its records of execution for all new DFS.	High	Storage.FC1 Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC7	Storage.T2 (Very High) Storage.T3 (Very High) Storage.T5 (Low) Storage.T6 (High) Storage.T9 (Very Low) Storage.T11 (Medium) Storage.T12 (Medium) Storage.T15 (Low) Storage.T29 (Low) Storage.T30 (Low) Storage.T31 (Low) Storage.T32 (Low)	High
Preventative (COSO) Protect (NIST CSF)	[Storage.C42, depends on Storage.C40] Prevent the use of unauthorized VNETs by the storage account (e.g. by using Azure Policy).	Configure an unauthorized VNETs on a storage account, it should be denied.	High	Storage.FC1 Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC7	Storage.T2 (Very High) Storage.T3 (Very High) Storage.T5 (Low) Storage.T6 (High) Storage.T9 (Very Low) Storage.T11 (Medium) Storage.T12 (Medium) Storage.T15 (Medium) Storage.T29 (Medium) Storage.T30 (Medium) Storage.T31 (Low) Storage.T32 (Low)	High
Assurance (COSO) Detect (NIST CSF)	[Storage.C43] Verify the unauthorized VNETs cannot access to the storage account.	Configure an unauthorized VNETs on a storage account, it should be detected.	Low	Storage.FC1 Storage.FC2 Storage.FC3 Storage.FC4	-	High

				Storage.FC7		

Block access to the endpoints [Storage.CO10]

Type	Control	Testing	Effort	Feature Class(es)	Threat(s) and Impact	CVSS-weighted Priority
Directive (COSO) Identify (NIST CSF)	[Storage.C45] Maintain a list of IPs authorized to access each storage account.	Request the list of authorized blobs to use allowblobPublicAccess enabled, its review process, and its review records.	Medium	Storage.FC1 Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC7	Storage.T2 (Very Low) Storage.T3 (Very Low) Storage.T5 (Very Low) Storage.T9 (Very Low) Storage.T11 (Very Low) Storage.T15 (Very Low) Storage.T29 (Very Low) Storage.T30 (Very Low) Storage.T31 (Very Low) Storage.T32 (Very Low)	High
Directive (COSO) Protect (NIST CSF)	[Storage.C46, depends on Storage.C45, assured by Storage.C48] Ensure traffic is denied from all networks including trusted services, logging and metrics read access, and allow traffic only from authorized list (ref).	Request 1) the mechanism ensuring firewall rules are in place 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	Medium	Storage.FC1 Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC7	Storage.T2 (High) Storage.T3 (High) Storage.T5 (High) Storage.T6 (High) Storage.T9 (Very Low) Storage.T11 (Medium) Storage.T12 (Medium) Storage.T15 (Medium) Storage.T29 (Medium) Storage.T30 (Medium) Storage.T31 (Low) Storage.T32 (Low)	High
Preventative (COSO) Protect (NIST CSF)	[Storage.C47, depends on Storage.C45] Prevent access from unauthorized IPs, by allowing only authorized IP using Azure Storage Firewall.	Access from unauthorized IPs, it should be denied.	Low	Storage.FC1 Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC7	Storage.T2 (Very Low) Storage.T15 (Medium) Storage.T29 (Medium) Storage.T30 (Medium) Storage.T31 (Low) Storage.T32 (Low)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C48] Verify access is possible only from allowed list (e.g. by using Azure Policy)	Connect to storage from not allowed IP, it should be detected.	Low	Storage.FC1 Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC7	-	High
Directive (COSO) Identify (NIST CSF)	[Storage.C92] Maintain a list of authorized storage accounts has static website hosting option enabled, ideally none	Request the list of authorized storage accounts with static website hosting option enabled, its review process, and its review records.	Low	Storage.FC2	Storage.T22 (Very Low)	High

Enable storage accounts monitoring & notifications [Storage.CO11]

Type	Control	Testing	Effort	Feature Class(es)	Threat(s) and Impact	CVSS-weighted Priority
Directive (COSO) Identify (NIST CSF)	[Storage.C30] Maintain a list of directories and blobs that do not need modification after uploading to DFS/blob.	Request the list of directories and blobs for immutable blobs functionality.	Medium	Storage.FC2	Storage.T7 (Very Low) Storage.T8 (Very Low) Storage.T9 (Very Low) Storage.T12 (Very Low)	High
Directive (COSO) Identify (NIST CSF)	[Storage.C53] Define a diagnostic settings design for storage accounts including destination (tenant/subscription), categories (ideally all) and rotation, based on requirement. Resource logs are not collected by default. You must create a diagnostic setting for each Azure resource to send its resource logs to a Log Analytics workspace to use with Azure Monitor Logs, Azure Event Hubs to forward outside of Azure, or to Azure storage for archiving.	Request the design of diagnostic settings for storage accounts, its review process, and its review records.	Low	Storage.FC2 Storage.FC7 Storage.FC8 Storage.FC9	Storage.T1 (Very Low) Storage.T3 (Very Low) Storage.T5 (Very Low) Storage.T7 (Very Low) Storage.T8 (Very Low) Storage.T9 (Very Low) Storage.T10 (Very Low) Storage.T13 (Very Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C54, depends on Storage.C53, assured by Storage.C57] Ensure diagnostic settings are configured properly to the architecture design.	Request 1) the mechanism ensuring only authorized diagnostic settings destinations are enabled, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	Low	Storage.FC2 Storage.FC7 Storage.FC8 Storage.FC9	Storage.T1 (Very Low) Storage.T3 (Very Low) Storage.T5 (Very Low) Storage.T7 (Very Low) Storage.T8 (Very Low) Storage.T9 (Very Low) Storage.T10 (Medium) Storage.T13 (Very Low)	Medium
Preventative (COSO) Protect (NIST CSF)	[Storage.C55, depends on Storage.C53] Ensure storage accounts have diagnostic settings configured according to the design.	Create a storage account with on approved diagnostic settings options, it should be denied.	Very Low	Storage.FC2 Storage.FC7 Storage.FC8 Storage.FC9	Storage.T1 (Very Low) Storage.T3 (Very Low) Storage.T5 (Very Low) Storage.T7 (Very Low) Storage.T8 (Very Low) Storage.T9 (Very Low) Storage.T10 (High) Storage.T13 (Very Low)	High
Detective (COSO) Detect (NIST CSF)	[Storage.C56] Monitor the creation/update of storage accounts with diagnostic settings enabled (e.g. using activity logs on operation name - create or update resource diagnostic setting)	Configure a storage account with an unauthorized diagnostic settings options, it should be detected.	Low	Storage.FC8	Storage.T10 (Medium)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C57] Verify storage accounts have diagnostic settings configured according to the design (e.g. using Azure	Create a storage account with unauthorized diagnostic settings options, it should be detected.	High	Storage.FC2 Storage.FC7 Storage.FC8 Storage.FC9	-	Medium

	Policy "Configure diagnostic settings for storage accounts to Log Analytics workspace" in audit mode).					
Detective (COSO) Protect (NIST CSF)	[Storage.C84] Monitor file shares quotas and trends using Azure Monitor with alarm (e.g. Azure file share size is 80% of capacity)	Create a file with unauthorized or default quota, it should be detected.	Very Low	Storage.FC3	Storage.T16 (Medium)	Low

Enforce encryption-at-rest [Storage.CO12]

Type	Control	Testing	Effort	Feature Class(es)	Threat(s) and Impact	CVSS-weighted Priority
Directive (COSO) Identify (NIST CSF)	[Storage.C63] Maintain a list of authorized keys for Azure storage encryption with desired assignment and rotation policy.	Request the list of authorized keys for Azure storage encryption with desired assignment and rotation policy, its review process, and its review records.	Low	Storage.FC1	Storage.T14 (Very Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C64, depends on Storage.C63, assured by Storage.C67] Ensure authorized keys for Azure storage encryption with desired assignment and rotation policy is set for authorized storage accounts.	Request 1) the mechanism ensuring only authorized keys for Azure storage encryption with desired assignment and rotation policy are in use, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC1	Storage.T14 (Medium)	Low
Preventative (COSO) Protect (NIST CSF)	[Storage.C65, depends on Storage.C63] Ensure only authorized keys for Azure storage encryption with desired assignment and rotation policy are assigned (e.g. using Azure Policy in deny mode).	Create a blob with unauthorized keys for Azure storage encryption, it should be denied.	Very Low	Storage.FC1	Storage.T14 (Medium)	Medium
Detective (COSO) Detect (NIST CSF)	[Storage.C66] Monitor the creation/update and usage keys for Azure storage encryption with desired assignment and rotation policy assignment (e.g. using monitoring logs on authentication type in AccountKey).	Configure a storage account with an unauthorized encryption settings, it should be detected.	Low	Storage.FC1	Storage.T14 (Medium)	Medium

Apply cloud adoption, strategy, and governance [Storage.CO13]

Type	Control	Testing	Effort	Feature Class(es)	Threat(s) and Impact	CVSS-weighted Priority
Directive (COSO) Identify (NIST CSF)	[Storage.C77] Maintain a list of authorized Azure storage region options.	Request the list of authorized Azure storage region, its review process, and its review records.	Low	Storage.FC1	Storage.T14 (Very Low)	Low
Directive (COSO) Protect (NIST CSF)	[Storage.C78, depends on Storage.C77, assured by Storage.C80] Ensure authorized Azure storage region is set for authorized storage accounts.	Request 1) the mechanism ensuring only Azure storage authorized region for storage accounts are in use, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC1	Storage.T14 (Very Low)	Very Low

Preventative (COSO) Protect (NIST CSF)	[Storage.C79, depends on Storage.C77] Ensure only authorized Azure storage region is set for authorized storage accounts (e.g. using Azure Policy in deny mode).	Create a storage account with unauthorized Azure storage region, it should be denied.	Very Low	Storage.FC1	Storage.T14 (Very Low)	Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C80] Verify only authorized Azure storage region is set for authorized storage accounts (e.g. using Azure Policy on audit mode).	Create a storage account with unauthorized Azure storage region, it should be detected.	High	Storage.FC1	-	Very Low

Govern Cross-Origin resource sharing [Storage.CO14]

Type	Control	Testing	Effort	Feature Class(es)	Threat(s) and Impact	CVSS-weighted Priority
Directive (COSO) Identify (NIST CSF)	[Storage.C96] Maintain a list of authorized CORS per endpoint trusted origins and corresponding settings.	Request the list of authorized storage accounts with CORS trusted origins and corresponding settings, its review process, and its review records.	Low	Storage.FC1	Storage.T26 (Very Low)	Very Low
Directive (COSO) Protect (NIST CSF)	[Storage.C97, depends on Storage.C96, assured by Storage.C99] Ensure only authorized storage accounts have CORS trusted origins and corresponding settings configured.	Request 1) the mechanism ensuring only authorized storage accounts have CORS trusted origins and corresponding settings configured, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC1	Storage.T26 (Low)	Very Low
Preventative (COSO) Protect (NIST CSF)	[Storage.C98, depends on Storage.C96] Prevent unauthorized storage accounts to use CORS trusted origins and corresponding settings (e.g. using Azure Policy in deny mode).	Create a storage account with untrusted CORS settings, it should be denied.	High	Storage.FC1	Storage.T26 (Very Low)	Very Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C99] Verify only authorized CORS trusted origins and corresponding settings are configured (e.g. using Azure Policy on audit mode).	Create a storage account with untrusted CORS settings, it should be detected.	High	Storage.FC1	-	Very Low

Scan input/output objects for malware [Storage.CO15]

Type	Control	Testing	Effort	Feature Class(es)	Threat(s) and Impact	CVSS-weighted Priority
Preventative (COSO) Detect (NIST CSF)	[Storage.C114] If the storage account is used as an input or the output of a process, scan the objects for malware (e.g. using VirusScan)	Inject a malware test file, it should be denied.	High	Storage.FC2	Storage.T12 (Very High)	Medium

Compliance Mapping

The Control Objectives are mapped to the Secure Controls Framework (SCF), provided under Attribution-NoDerivatives 4.0 International (CC BY-ND 4.0). Compliance mappings are not designed to fully ensure compliance with a specific governance or compliance standard. You are responsible for making your own assessment of whether your use of the Services meets applicable legal and regulatory requirements.

You can change the displayed Compliance mappings by contacting chatbot@trustoncloud.com.

Appendixes

Appendix 1 - Prioritized list for control implementation

Type	Control	Testing	Effort	Feature Class(es)	Threat(s) and Impact	CVSS-weighted Priority
Directive (COSO) Protect (NIST CSF)	[Storage.C1] Limit the access to the IAM actions required to perform attacks using Azure IAM, following the IAM Operating Model and using the Azure IAM ThreatModel.	Request the list of authorized IAM principals that have the permissions required to launch attacks, its review process, and its review records.	Medium	Storage.FC1 Storage.FC10 Storage.FC2 Storage.FC4 Storage.FC6 Storage.FC7	Storage.T1 (Medium) Storage.T2 (Medium) Storage.T4 (Medium) Storage.T5 (Medium) Storage.T6 (Medium) Storage.T7 (Medium) Storage.T8 (Medium) Storage.T9 (Medium) Storage.T12 (Medium) Storage.T23 (High) Storage.T24 (Medium) Storage.T25 (Medium) Storage.T31 (Low) Storage.T32 (Low)	Very High
Preventative (COSO) Protect (NIST CSF)	[Storage.C23] Limit access to delete storage accounts, via Azure Policy and IAM. Do not ever delete a sensitive storage account (e.g. just delete all data) to make sure that storage account FQDN cannot be used as a source of attacks.	Try to delete storage account, it should be denied	Medium	Storage.FC2	Storage.T5 (Very High)	Very High
Preventative (COSO) Protect (NIST CSF)	[Storage.C82, assured by Storage.C83] Block the usage of storage account access key, whenever possible.	Try to connect using storage account access keys - Expected error "key based authentication is not permitted on this storage account", it should be denied.	Medium	Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC5 Storage.FC7	Storage.T1 (Very High) Storage.T2 (Very High) Storage.T3 (Very High) Storage.T9 (Very Low) Storage.T12 (Very High) Storage.T16 (Very Low) Storage.T17 (Low) Storage.T27 (Low) Storage.T28 (Low)	Very High
Assurance (COSO) Detect (NIST CSF)	[Storage.C83] Verify only authorized authorization method set for authorized blob, file shares, queues, tables, DFS (e.g. using Azure Policy on audit mode).	Configure a blob, file share, queue, table, or DFS with an unauthorized authorization method, it should be detected.	High	Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC5 Storage.FC7	-	Very High
Directive (COSO) Identify (NIST CSF)	[Storage.C111] Maintain a list of authorized storage and corresponding accounts locks.	Request the list of authorized storage accounts locks settings, its review process, and its review records.	Very Low	Storage.FC2	Storage.T5 (Very Low)	Very High

Directive (COSO) Protect (NIST CSF)	[Storage.C112, depends on Storage.C111, assured by Storage.C113] Lock storage account to prevent accidental or malicious deletion or configuration changes and ensure only authorized storage accounts have lock disabled.	Request 1) the mechanism ensuring only authorized storage accounts have locks disabled, 2) its records of execution for all new storage accounts locks, and 3) plan to move any older storage accounts	Very Low	Storage.FC2	Storage.T5 (High)	Very High
Assurance (COSO) Detect (NIST CSF)	[Storage.C113] Verify the creation/update of storage accounts lock and corresponding settings (e.g. using activity logs "localized Value": "Delete management locks").	Delete a storage account lock, it should be detected.	Very Low	Storage.FC2	-	Very High
Directive (COSO) Identify (NIST CSF)	[Storage.C68] Maintain a list of authorized encryption in transit methods with desired assignment to storage accounts. Ideally minimum TLS 1.2.	Request the list of authorized encryption in transit methods, its review process, and its review records.	Very Low	Storage.FC1 Storage.FC3	Storage.T11 (Very Low) Storage.T21 (Very Low)	Very High
Directive (COSO) Protect (NIST CSF)	[Storage.C69, depends on Storage.C68, assured by Storage.C72] Ensure authorized encryption in transit methods with desired assignment is set for authorized storage accounts.	Request 1) the mechanism ensuring only encryption in transit methods with desired assignment are in use, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	Low	Storage.FC1 Storage.FC3	Storage.T11 (High) Storage.T21 (Medium)	Very High
Preventative (COSO) Protect (NIST CSF)	[Storage.C70, depends on Storage.C68] Ensure storage accounts have authorized encryption in transit methods configured (e.g. using Azure Policy in deny mode).	Create a blob with unauthorized encryption in transit methods for Azure storage, it should be denied.	Medium	Storage.FC1 Storage.FC3	Storage.T11 (Very High) Storage.T21 (Medium)	Very High
Assurance (COSO) Detect (NIST CSF)	[Storage.C72] Verify only authorized encryption in transit methods with desired assignment is set for authorized storage accounts (e.g. using Azure Policy on audit mode).	Configure a storage account with an unauthorized encryption in transit settings, it should be detected.	Low	Storage.FC1 Storage.FC3	-	Very High
Directive (COSO) Protect (NIST CSF)	[Storage.C28, depends on Storage.C27] Ensure only authorized Groups are used in ACLs for data Lake storage Gen2.	Review ACLs against usage of individual users' service principal.	Low	Storage.FC2 Storage.FC3 Storage.FC7	Storage.T1 (Very Low) Storage.T2 (Very Low) Storage.T7 (High) Storage.T9 (Very Low) Storage.T15 (Low) Storage.T30 (Low)	High
Directive (COSO) Protect (NIST CSF)	[Storage.C33, depends on Storage.C32] Integrate the access to directories and objects via ACL in the IAM Operating Model, not mixing IAM and ACL access method.	Request the IAM operating model for the directories and objects.	Low	Storage.FC2 Storage.FC3	Storage.T6 (Very Low) Storage.T7 (High) Storage.T9 (High) Storage.T15 (Very Low) Storage.T30 (Very Low)	High
Directive (COSO) Protect (NIST CSF)	[Storage.C31, depends on Storage.C30] Use immutable blobs.	Check the usage of immutable blobs.	Medium	Storage.FC2	Storage.T8 (Very High) Storage.T9 (Very High) Storage.T12 (Medium)	High
Directive (COSO) Protect (NIST CSF)	[Storage.C5, depends on Storage.C1] Integrate the access to files and directories via ACL in the IAM Operating Model	Request the IAM operating model for the access to files and directories via ACL	Low	Storage.FC2 Storage.FC4	Storage.T7 (High) Storage.T9 (Very Low) Storage.T31 (Low) Storage.T32 (Low)	High

Preventative (COSO) Protect (NIST CSF)	[Storage.C94, depends on Storage.C92] Prevent unauthorized storage accounts to have the static website hosting option enabled (e.g. using Azure Policy on deny mode).	Create a storage account with a static website hosting option enabled, it should be denied.	Very Low	Storage.FC2	Storage.T22 (Medium)	High
Directive (COSO) Identify (NIST CSF)	[Storage.C58] Maintain a list of authorized blob and containers with public access level set to anonymous, ideally none	Request the list of authorized blob and containers with public access level set to anonymous, its review process, and its review records.	Low	Storage.FC2	Storage.T5 (Very Low) Storage.T6 (Very Low)	High
Preventative (COSO) Protect (NIST CSF)	[Storage.C60, depends on Storage.C58] Ensure only authorized blob and containers are anonymously accessed (e.g. using Azure Policy in deny mode).	Create a blob, or a container anonymously accessible, it should be denied.	Very Low	Storage.FC2	Storage.T5 (Medium) Storage.T6 (Low)	High
Directive (COSO) Identify (NIST CSF)	[Storage.C40] Maintain a list of authorized VNETs for the blob, file shares, queues, tables, DFS access via private endpoint.	Request the list of authorized IPs, its review process, and its review records.	Low	Storage.FC1 Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC7	Storage.T2 (Very Low) Storage.T3 (Very Low) Storage.T5 (Very Low) Storage.T6 (Very Low) Storage.T9 (Very Low) Storage.T11 (Very Low) Storage.T12 (Very Low) Storage.T15 (Very Low) Storage.T29 (Very Low) Storage.T30 (Very Low) Storage.T31 (Very Low) Storage.T32 (Very Low)	High
Directive (COSO) Protect (NIST CSF)	[Storage.C41, depends on Storage.C40, assured by Storage.C43] Ensure only authorized VNET are configured for the blob, file shares, queues, tables, DFS.	Request 1) the mechanism ensuring PE are in place 2) its records of execution for all new DFS.	High	Storage.FC1 Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC7	Storage.T2 (Very High) Storage.T3 (Very High) Storage.T5 (Low) Storage.T6 (High) Storage.T9 (Very Low) Storage.T11 (Medium) Storage.T12 (Medium) Storage.T15 (Low) Storage.T29 (Low) Storage.T30 (Low) Storage.T31 (Low) Storage.T32 (Low)	High
Preventative (COSO) Protect (NIST CSF)	[Storage.C42, depends on Storage.C40] Prevent the use of unauthorized VNETs by the storage account (e.g. by using Azure Policy).	Configure an unauthorized VNETs on a storage account, it should be denied.	High	Storage.FC1 Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC7	Storage.T2 (Very High) Storage.T3 (Very High) Storage.T5 (Low) Storage.T6 (High) Storage.T9 (Very Low) Storage.T11 (Medium) Storage.T12 (Medium) Storage.T15 (Medium) Storage.T29 (Medium)	High

					Storage.T30 (Medium) Storage.T31 (Low) Storage.T32 (Low)	
Assurance (COSO) Detect (NIST CSF)	[Storage.C43] Verify the unauthorized VNETs cannot access to the storage account.	Configure an unauthorized VNETs on a storage account, it should be detected.	Low	Storage.FC1 Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC7	-	High
Directive (COSO) Identify (NIST CSF)	[Storage.C45] Maintain a list of IPs authorized to access each storage account.	Request the list of authorized blobs to use allowblobPublicAccess enabled, its review process, and its review records.	Medium	Storage.FC1 Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC7	Storage.T2 (Very Low) Storage.T3 (Very Low) Storage.T5 (Very Low) Storage.T9 (Very Low) Storage.T11 (Very Low) Storage.T15 (Very Low) Storage.T29 (Very Low) Storage.T30 (Very Low) Storage.T31 (Very Low) Storage.T32 (Very Low)	High
Directive (COSO) Protect (NIST CSF)	[Storage.C46, depends on Storage.C45, assured by Storage.C48] Ensure traffic is denied from all networks including trusted services, logging and metrics read access, and allow traffic only from authorized list (ref).	Request 1) the mechanism ensuring firewall rules are in place 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	Medium	Storage.FC1 Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC7	Storage.T2 (High) Storage.T3 (High) Storage.T5 (High) Storage.T6 (High) Storage.T9 (Very Low) Storage.T11 (Medium) Storage.T12 (Medium) Storage.T15 (Medium) Storage.T29 (Medium) Storage.T30 (Medium) Storage.T31 (Low) Storage.T32 (Low)	High
Assurance (COSO) Detect (NIST CSF)	[Storage.C48] Verify access is possible only from allowed list (e.g. by using Azure Policy)	Connect to storage from not allowed IP, it should be detected.	Low	Storage.FC1 Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC7	-	High
Directive (COSO) Identify (NIST CSF)	[Storage.C92] Maintain a list of authorized storage accounts has static website hosting option enabled, ideally none	Request the list of authorized storage accounts with static website hosting option enabled, its review process, and its review records.	Low	Storage.FC2	Storage.T22 (Very Low)	High
Directive (COSO) Identify (NIST CSF)	[Storage.C30] Maintain a list of directories and blobs that do not need modification after uploading to DFS/blob.	Request the list of directories and blobs for immutable blobs functionality.	Medium	Storage.FC2	Storage.T7 (Very Low) Storage.T8 (Very Low) Storage.T9 (Very Low) Storage.T12 (Very Low)	High

Preventative (COSO) Protect (NIST CSF)	[Storage.C55, depends on Storage.C53] Ensure storage accounts have diagnostic settings configured according to the design.	Create a storage account with on approved diagnostic settings options, it should be denied.	Very Low	Storage.FC2 Storage.FC7 Storage.FC8 Storage.FC9	Storage.T1 (Very Low) Storage.T3 (Very Low) Storage.T5 (Very Low) Storage.T7 (Very Low) Storage.T8 (Very Low) Storage.T9 (Very Low) Storage.T10 (High) Storage.T13 (Very Low)	High
Directive (COSO) Identify (NIST CSF)	[Storage.C27] Maintain a list of authorized Groups to use in permissions for data Lake storage Gen2.	Request the list of authorized Groups, its review process, and its review records.	Very Low	Storage.FC2 Storage.FC3	Storage.T6 (Very Low) Storage.T7 (Very Low) Storage.T8 (Very Low) Storage.T15 (Very Low) Storage.T30 (Very Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C29, depends on Storage.C27] Use name convention for Groups adding Suffix R/RW and Entity to be used.	Review Group-Name convention.	Medium	Storage.FC2 Storage.FC3 Storage.FC7	Storage.T1 (Very Low) Storage.T2 (Very Low) Storage.T7 (High) Storage.T9 (Very Low) Storage.T15 (Low) Storage.T30 (Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C44] Managed Identity is the preferred method for accessing data Lake storage Gen2 from parent services.	Check if underlying services are not using SAS, or other password methods to authenticate.	Medium	Storage.FC2 Storage.FC7	Storage.T2 (Very Low) Storage.T3 (Very Low) Storage.T12 (High)	Medium
Corrective (COSO) Protect (NIST CSF)	[Storage.C81] Integrate the access to blob, file shares, queues, tables and DFS via SAS token in the IAM Operating Model, ideally prioritising AD as preferred method.	Check if (Azure) Active Directory is used for assigning permissions.	Medium	Storage.FC3 Storage.FC4 Storage.FC5 Storage.FC7	Storage.T1 (Low) Storage.T3 (Low) Storage.T16 (Very Low) Storage.T17 (Low) Storage.T18 (Low) Storage.T19 (Low) Storage.T27 (Low) Storage.T28 (Low)	Medium
Directive (COSO) Identify (NIST CSF)	[Storage.C2] Define an ACL or IAM authentication for every data Lake storage Gen2. Ideally use Azure AD only, and multiple DLS if fine-grained access is required.	Request the list of all storage accounts you control, define their authorized data classification, identify whether the data is primary and the mechanism and records to ensure the accuracy of those metadata	High	Storage.FC2 Storage.FC3	Storage.T5 (Very Low) Storage.T15 (Very Low) Storage.T30 (Very Low)	Medium
Detective (COSO) Detect (NIST CSF)	[Storage.C3, depends on Storage.C2] Use a data discovery tool to control that no sensitive data are stored in unauthorized storage account	Upload a higher classification data in a storage account, it should be detected.	Medium	Storage.FC2	Storage.T5 (Medium)	Medium
Directive (COSO) Identify (NIST CSF)	[Storage.C24] Maintain a list of authorized IPs to use SAS tokens, and their authorized time window.	Request the list of authorized IPs to use SAS tokens, its review process, and its review records.	Very Low	Storage.FC4 Storage.FC7	Storage.T3 (Very Low) Storage.T31 (Very Low) Storage.T32 (Very Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C25, depends on Storage.C24, assured by Storage.C26]	Request 1) the mechanism ensuring SAS tokens allow only authorized IPs, 2) its records of execution for all	Very Low	Storage.FC2 Storage.FC4	Storage.T1 (Low) Storage.T3 (Low)	Medium

	Ensure SAS tokens allow only authorized IPs, using the sourceIP field and enforcing HTTPS.	new SAS tokens, and 3) plan to move any older SAS tokens.		Storage.FC7	Storage.T9 (Very Low) Storage.T12 (Medium) Storage.T31 (Low) Storage.T32 (Low)	
Assurance (COSO) Detect (NIST CSF)	[Storage.C26] Verify SAS tokens only allow authorized IPs.	Deploy a SAS token with an unauthorized IP, it should be detected	Medium	Storage.FC2 Storage.FC4 Storage.FC7	-	Medium
Directive (COSO) Identify (NIST CSF)	[Storage.C6] Maintain a list of authorized storage accounts with allowblobPublicAccess enabled, ideally none	Request the list of authorized storage accounts with allowblobPublicAccess enabled, its review process, and its review records.	Low	Storage.FC2	Storage.T5 (Very Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C7, depends on Storage.C6, assured by Storage.C9] Ensure no storage accounts have allowblobPublicAccess enabled, except if authorized.	Request 1) the mechanism ensuring only authorized storage accounts have allowblobPublicAccess enabled, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC2 Storage.FC3	Storage.T5 (Medium) Storage.T15 (Very Low) Storage.T30 (Very Low)	Medium
Preventative (COSO) Protect (NIST CSF)	[Storage.C8, depends on Storage.C6] Prevent the creation/update of storage accounts with allowblobPublicAccess enabled (e.g. using Azure Policy on deny mode - "[Preview]: storage account public access should be disallowed").	Create a storage account with allowblobPublicAccess, it should be denied.	High	Storage.FC2 Storage.FC3	Storage.T5 (Medium) Storage.T6 (Medium) Storage.T15 (Very Low) Storage.T30 (Very Low)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C9] Verify no storage accounts have allowblobPublicAccess enabled (e.g. using Azure Policy on audit mode - "[Preview]: storage account public access should be disallowed").	Create a storage account with allowblobPublicAccess, it should be detected.	High	Storage.FC2 Storage.FC3	-	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C52] Verify storage accounts with cross-tenant replication enabled (e.g. using Azure Policy "storage accounts should prevent cross tenant object replication" in audit mode.).	Creation of storage account with cross-tenant option enabled, it should be detected.	Low	Storage.FC2 Storage.FC9	-	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C93, depends on Storage.C92, assured by Storage.C95] Ensure only authorized storage accounts has the static website hosting option enabled.	Request 1) the mechanism ensuring only authorized storage accounts has static website hosting option enabled, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC2	Storage.T22 (Medium)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C95] Verify only authorized storage accounts has the static website hosting option enabled (e.g. using Azure Policy on audit mode).	Create a storage account with a static website hosting option enabled, it should be detected.	High	Storage.FC2	-	Medium
Directive (COSO) Recover (NIST CSF)	[Storage.C12] Backup primary data in a location which have different security authority (ref 1, ref 2)	Request the mechanism used to backup primary data in a location which have different security authority, its records of execution, and records of restoration testing	High	Storage.FC2 Storage.FC3	Storage.T7 (High) Storage.T17 (Low) Storage.T18 (Medium) Storage.T19 (Medium) Storage.T20 (Medium)	Medium

Directive (COSO) Protect (NIST CSF)	[Storage.C49] Ensure corporate backup policies are implemented for the blob, file shares, queues, tables, DFS, including regular testing.	Request the backup policies for DFS, its review process, and its review records.	Low	Storage.FC2	Storage.T7 (Medium) Storage.T9 (Medium) Storage.T12 (Medium)	Medium
Directive (COSO) Identify (NIST CSF)	[Storage.C50] Maintain a list of objects with cross-tenant replication enabled.	Request the list of authorized objects use allow cross-tenant replication, its review process, and its review records.	Low	Storage.FC2 Storage.FC9	Storage.T5 (Very Low) Storage.T13 (Very Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C51, depends on Storage.C50, assured by Storage.C52] Ensure cross-tenant replication is allowed only for specific storage accounts.	Request 1) the mechanism ensuring allowblobPublicAccess allow only authorized blobs, 2) its records of execution for all new blobs.	High	Storage.FC2 Storage.FC9	Storage.T5 (High) Storage.T6 (High) Storage.T13 (High)	Medium
Directive (COSO) Identify (NIST CSF)	[Storage.C13] For each storage account (or type of data), define the minimum retention of container and blob from the deletion (e.g. 7 days)	For each storage account, request the minimum retention of container and blob from the deletion, its review process, and its review records	Low	Storage.FC2	Storage.T7 (Very Low) Storage.T9 (Very Low) Storage.T12 (Very Low)	Medium
Preventative (COSO) Protect (NIST CSF)	[Storage.C15, depends on Storage.C13] Prevent the creation of storage accounts without soft-delete for the blob option (e.g. by using an Azure Policy in deny mode).	Create a storage account without soft-delete for the blob, it should be denied	High	Storage.FC2	Storage.T9 (High)	Medium
Preventative (COSO) Protect (NIST CSF)	[Storage.C18, depends on Storage.C13] Prevent the creation of storage accounts without soft-delete for the container option (e.g. by using an Azure Policy in deny mode).	Create a storage account without soft-delete for the container, it should be denied.	High	Storage.FC2	Storage.T9 (High)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C34, assured by Storage.C36] Ensure storage accounts have soft-delete for the blob enabled	Request 1) the mechanism ensuring storage accounts have soft-delete for the blob enabled, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC2 Storage.FC6	Storage.T6 (Very Low) Storage.T7 (Very Low) Storage.T9 (Very Low) Storage.T12 (Very Low) Storage.T25 (Low)	Medium
Preventative (COSO) Protect (NIST CSF)	[Storage.C35] Prevent the creation of storage accounts without soft-delete for the blob option (e.g. by using an Azure Policy "Microsoft.storage/storageaccounts/deleteRetentionPolicy" in deny mode).	Create a storage account without soft-delete for the blob, it should be denied	High	Storage.FC2 Storage.FC6	Storage.T9 (High) Storage.T25 (Low)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C36] Verify all storage accounts have soft-delete for the blob enabled	Create a storage account without soft-delete for the blob option, it should be detected.	Low	Storage.FC2 Storage.FC6	-	Medium
Preventative (COSO) Protect (NIST CSF)	[Storage.C38, depends on Storage.C34] Prevent the creation of storage accounts without soft-delete for the container option (e.g. by using an Azure Policy in deny mode).	Create a storage account without soft-delete for the container, it should be denied.	High	Storage.FC2 Storage.FC6	Storage.T9 (High) Storage.T25 (Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C59, depends on Storage.C58, assured by Storage.C62]	Request 1) the mechanism ensuring only authorized blob / container are anonymously accessed, 2) its	High	Storage.FC2	Storage.T5 (Medium) Storage.T6 (Low)	Medium

	Ensure anonymous access level is set only for authorized blobs / containers.	records of execution for all new storage accounts, and 3) plan to move any older storage accounts				
Detective (COSO) Detect (NIST CSF)	[Storage.C61] Monitor the creation/update of blob and containers that are anonymously accessed (e.g. using Azure Automations).	Create a blob, or a container anonymously accessible, it should be detected.	Low	Storage.FC2	Storage.T5 (Medium) Storage.T6 (Low)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C62] Verify only authorized blob or containers are anonymously accessible (e.g. using Azure Policy on audit mode).	Create 1) a blob, or 2) a container anonymously accessible, it should be detected.	High	Storage.FC2	-	Medium
Directive (COSO) Identify (NIST CSF)	[Storage.C85] For each file share, define the minimum retention of container and blob from the deletion (e.g. 7 days)	For each file share, request the minimum retention from the deletion, its review process, and its review records	High	Storage.FC3	Storage.T18 (Very Low) Storage.T19 (Very Low) Storage.T20 (Very Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C86, depends on Storage.C85, assured by Storage.C88] Ensure file shares have soft-delete enabled for at least the defined minimum retention	Request 1) the mechanism ensuring file shares have soft-delete enabled for at least the defined minimum retention, 2) it's records of execution for all new file shares, and 3) plan to move any older file shares	Low	Storage.FC3	Storage.T18 (Medium) Storage.T19 (Very Low) Storage.T20 (Very Low)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C88] Verify all file shares have soft-delete (e.g. by using an Azure Policy in audit mode).	Create a file share without soft-delete , it should be detected.	Low	Storage.FC3	-	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C108, assured by Storage.C110] Ensure storage accounts have Azure Defender enabled	Request 1) the mechanism ensuring storage accounts have Azure Defender for storage account enabled, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	Medium	Storage.FC2 Storage.FC3 Storage.FC7	Storage.T2 (Very Low) Storage.T3 (Very Low) Storage.T5 (Low) Storage.T20 (Medium)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C110] Verify storage accounts without Azure Defender for storage account enabled.	Create a storage account without Azure Defender for storage account, it should be detected.	Low	Storage.FC2 Storage.FC3 Storage.FC7	-	Medium
Directive (COSO) Identify (NIST CSF)	[Storage.C20] Maintain a list of authorized storage accounts with hierarchical namespace (DFS) option enabled.	Request the list of authorized {resources}, its review process, and its review records	Medium	Storage.FC2	Storage.T6 (Very Low) Storage.T7 (Very Low) Storage.T30 (Very Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C21, depends on Storage.C20, assured by Storage.C22] Ensure only authorized storage accounts with hierarchical namespace (DFS) option enabled are configured	Request 1) the mechanism ensuring only authorized storage accounts with hierarchical namespace (DFS) option enabled are configured, 2) its records of execution for all new storage accounts with hierarchical namespace (DFS) option enabled and 3) plan to move any older storage accounts with hierarchical namespace (DFS) option enabled.	Medium	Storage.FC2	Storage.T6 (Low) Storage.T7 (Low) Storage.T30 (Low)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C22] Verify storage accounts with hierarchical namespace (DFS) option enabled are not configured (e.g. by using an Azure Policy {"isHnsEnabled": "true"} in audit mode)	Create a storage account with hierarchical namespace (DFS) option enabled, it should be detected	Medium	Storage.FC2	-	Medium

Detective (COSO) Detect (NIST CSF)	[Storage.C71] Monitor the creation/update usage encryption in transit methods with desired assignment is set for authorized storage accounts (e.g. using activity logs on properties.supportsHttpsTrafficOnly scope "supportsHttpsTrafficOnly").	Configure a storage account with an unauthorized encryption in transit settings, it should be detected.	Low	Storage.FC1 Storage.FC3	Storage.T11 (Medium) Storage.T21 (Medium)	Medium
Preventative (COSO) Protect (NIST CSF)	[Storage.C47, depends on Storage.C45] Prevent access from unauthorized IPs, by allowing only authorized IP using Azure Storage Firewall.	Access from unauthorized IPs, it should be denied.	Low	Storage.FC1 Storage.FC2 Storage.FC3 Storage.FC4 Storage.FC7	Storage.T2 (Very Low) Storage.T15 (Medium) Storage.T29 (Medium) Storage.T30 (Medium) Storage.T31 (Low) Storage.T32 (Low)	Medium
Directive (COSO) Identify (NIST CSF)	[Storage.C53] Define a diagnostic settings design for storage accounts including destination (tenant/subscription), categories (ideally all) and rotation, based on requirement. Resource logs are not collected by default. You must create a diagnostic setting for each Azure resource to send its resource logs to a Log Analytics workspace to use with Azure Monitor Logs, Azure Event Hubs to forward outside of Azure, or to Azure storage for archiving.	Request the design of diagnostic settings for storage accounts, its review process, and its review records.	Low	Storage.FC2 Storage.FC7 Storage.FC8 Storage.FC9	Storage.T1 (Very Low) Storage.T3 (Very Low) Storage.T5 (Very Low) Storage.T7 (Very Low) Storage.T8 (Very Low) Storage.T9 (Very Low) Storage.T10 (Very Low) Storage.T13 (Very Low)	Medium
Directive (COSO) Protect (NIST CSF)	[Storage.C54, depends on Storage.C53, assured by Storage.C57] Ensure diagnostic settings are configured properly to the architecture design.	Request 1) the mechanism ensuring only authorized diagnostic settings destinations are enabled, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	Low	Storage.FC2 Storage.FC7 Storage.FC8 Storage.FC9	Storage.T1 (Very Low) Storage.T3 (Very Low) Storage.T5 (Very Low) Storage.T7 (Very Low) Storage.T8 (Very Low) Storage.T9 (Very Low) Storage.T10 (Medium) Storage.T13 (Very Low)	Medium
Detective (COSO) Detect (NIST CSF)	[Storage.C56] Monitor the creation/update of storage accounts with diagnostic settings enabled (e.g. using activity logs on operation name - create or update resource diagnostic setting)	Configure a storage account with an unauthorized diagnostic settings options, it should be detected.	Low	Storage.FC8	Storage.T10 (Medium)	Medium
Assurance (COSO) Detect (NIST CSF)	[Storage.C57] Verify storage accounts have diagnostic settings configured according to the design (e.g. using Azure Policy "Configure diagnostic settings for storage accounts to Log Analytics workspace" in audit mode).	Create a storage account with unauthorized diagnostic settings options, it should be detected.	High	Storage.FC2 Storage.FC7 Storage.FC8 Storage.FC9	-	Medium
Directive (COSO) Identify (NIST CSF)	[Storage.C63] Maintain a list of authorized keys for Azure storage encryption with desired assignment and rotation policy.	Request the list of authorized keys for Azure storage encryption with desired assignment and rotation policy, its review process, and its review records.	Low	Storage.FC1	Storage.T14 (Very Low)	Medium

Preventative (COSO) Protect (NIST CSF)	[Storage.C65, depends on Storage.C63] Ensure only authorized keys for Azure storage encryption with desired assignment and rotation policy are assigned (e.g. using Azure Policy in deny mode).	Create a blob with unauthorized keys for Azure storage encryption, it should be denied.	Very Low	Storage.FC1	Storage.T14 (Medium)	Medium
Detective (COSO) Detect (NIST CSF)	[Storage.C66] Monitor the creation/update and usage keys for Azure storage encryption with desired assignment and rotation policy assignment (e.g. using monitoring logs on authentication type in AccountKey).	Configure a storage account with an unauthorized encryption settings, it should be detected.	Low	Storage.FC1	Storage.T14 (Medium)	Medium
Preventative (COSO) Detect (NIST CSF)	[Storage.C114] If the storage account is used as an input or the output of a process, scan the objects for malware (e.g. using VirusScan)	Inject a malware test file, it should be denied.	High	Storage.FC2	Storage.T12 (Very High)	Medium
Directive (COSO) Identify (NIST CSF)	[Storage.C89] Maintain a revocation plan for any SAS or storage account access keys that you issue to clients based on requirements. If a SAS is compromised, you need to revoke that SAS as soon as possible. To revoke a user delegation SAS, revoke the user delegation key to quickly invalidate all signatures associated with that key. To revoke a service SAS that is associated with a stored access policy, you can delete the stored access policy, rename the policy, or change its expiry time to a time that is in the past (ref).	Request the of authorized revocation plan for any SAS or storage account access keys, its review process, and its review records.	Low	Storage.FC3 Storage.FC7	Storage.T1 (Very Low) Storage.T2 (Very Low) Storage.T3 (Very Low) Storage.T16 (Very Low)	Low
Directive (COSO) Protect (NIST CSF)	[Storage.C90, depends on Storage.C89, assured by Storage.C91] Ensure the revocation plan is in place for any SAS or storage account access key.	Request 1) the mechanism ensuring revocation plan in place for any SAS or storage account access keys is in use, 2) its records of testing for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC3 Storage.FC7	Storage.T1 (Very Low) Storage.T2 (Low) Storage.T3 (Very Low) Storage.T16 (Very Low)	Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C91] Verify the revocation plan is in place for any SAS or storage account access key.	Check test executions. Any unsuccessful attempts, it should be detected	High	Storage.FC3 Storage.FC7	-	Low
Detective (COSO) Detect (NIST CSF)	[Storage.C4] Use a data discovery tool to ensure the storage account names, object names, and tags do not contain sensitive data	Create 1) a storage account name, 2) object names, or 3) tags with sensitive data, it should be detected.	Very High	Storage.FC2	Storage.T5 (Medium)	Low
Directive (COSO) Protect (NIST CSF)	[Storage.C10, assured by Storage.C11] Enable versioning on blobs holding primary data	Request the mechanism used to ensure versioning on blobs holding primary data, and its records	Medium	Storage.FC2	Storage.T7 (Low)	Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C11] Verify blobs holding primary data are versioned	Remove versioning from a blob holding primary data, it should be detected	High	Storage.FC2	-	Low
Directive (COSO) Identify (NIST CSF)	[Storage.C73] Maintain a list of authorized Azure storage redundancy options.	Request the list of authorized Azure storage redundancy, its review process, and its review records.	Low	Storage.FC1	Storage.T14 (Very Low)	Low

Preventative (COSO) Protect (NIST CSF)	[Storage.C75, depends on Storage.C73] Ensure only authorized Azure storage redundancy is set for authorized storage accounts (e.g. using Azure Policy in deny mode).	Create a blob with unauthorized Azure storage redundancy for Azure storage, it should be denied.	Very Low	Storage.FC1	Storage.T14 (Very Low)	Low
Directive (COSO) Protect (NIST CSF)	[Storage.C37, assured by Storage.C39] Ensure storage accounts have soft-delete for the container enabled	Request 1) the mechanism ensuring storage accounts have soft-delete for the container enabled, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	Medium	Storage.FC2 Storage.FC6	Storage.T7 (Very Low) Storage.T9 (Very Low) Storage.T12 (Very Low) Storage.T25 (Low)	Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C39] Verify storage accounts without soft-delete for the container are not configured.	Create a storage account without soft-delete for the container option, it should be detected.	Low	Storage.FC2 Storage.FC6	-	Low
Preventative (COSO) Protect (NIST CSF)	[Storage.C87, depends on Storage.C85] Prevent the creation of file shares without soft-delete (e.g. by using an Azure Policy in deny mode).	Create a file share without soft-delete, it should be denied	High	Storage.FC3	Storage.T18 (Medium) Storage.T19 (Very Low) Storage.T20 (Very Low)	Low
Directive (COSO) Protect (NIST CSF)	[Storage.C105, assured by Storage.C107] Ensure storage accounts have Azure Defender for Storage account enabled" with "Ensure storage accounts have Azure Defender for storage account enabled	Request 1) the mechanism ensuring storage accounts have Azure Defender for storage account enabled, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC2 Storage.FC3 Storage.FC7	Storage.T2 (Very Low) Storage.T3 (Very Low) Storage.T5 (Very Low) Storage.T20 (Very Low)	Low
Preventative (COSO) Protect (NIST CSF)	[Storage.C106] Prevent the creation of storage accounts without Azure Defender for storage account option (e.g. by using an Azure Policy "Microsoft.storage/storageaccounts/deleteRetentionPolicy" in deny mode).	Create a storage account without Azure Defender for storage account, it should be denied	High	Storage.FC2 Storage.FC3 Storage.FC7	Storage.T2 (Very Low) Storage.T3 (Very Low) Storage.T5 (Low) Storage.T20 (Medium)	Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C107] Verify all storage accounts have Azure Defender for storage account enabled	Create a storage account without Azure Defender for storage account option, it should be detected.	Low	Storage.FC2 Storage.FC3 Storage.FC7	-	Low
Preventative (COSO) Protect (NIST CSF)	[Storage.C109, depends on Storage.C105] Prevent the creation of storage accounts without Azure Defender (e.g. by using an Azure Policy in deny mode).	Create a storage account without Azure Defender for storage account, it should be denied.	High	Storage.FC2 Storage.FC3 Storage.FC7	Storage.T2 (Very Low) Storage.T3 (Very Low) Storage.T5 (Very Low) Storage.T20 (Very Low)	Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C67] Verify only authorized keys for Azure storage encryption with desired assignment and rotation policy are in use (e.g. using Azure Policy on audit mode).	Configure a storage account with an unauthorized encryption settings, it should be detected.	High	Storage.FC1	-	Low
Directive (COSO) Identify (NIST CSF)	[Storage.C100] Maintain a list of authorized SMB 2.1 Azure Files.	Request the list of authorized SMB 2.1 Azure Files with SMB 2.1 settings, its review process, and its review records.	Low	Storage.FC3	Storage.T21 (Very Low)	Low
Directive (COSO) Protect (NIST CSF)	[Storage.C101, depends on Storage.C100, assured by Storage.C104] Ensure only authorized Azure Files SMB 2.1 have encryption disabled.	Request 1) the mechanism ensuring only authorized SMB 2.1 Azure Files have encryption disabled, 2) its	High	Storage.FC3	Storage.T21 (Low)	Low

		records of execution for all new SMB 2.1 Azure Files, and 3) plan to move any older storage accounts				
Preventative (COSO) Protect (NIST CSF)	[Storage.C102, depends on Storage.C100] Prevent unauthorized Azure Files SMB 2.1 to have encryption disabled (e.g. using Azure Policy in deny mode).	Create a storage account with encryption disabled, it should be denied.	High	Storage.FC3	Storage.T21 (Low)	Low
Detective (COSO) Detect (NIST CSF)	[Storage.C103] Monitor the creation/update of Azure Files SMB 2.1 and corresponding settings (e.g. using activity logs on properties.supportsHttpsTrafficOnly scope "supportsHttpsTrafficOnly").	Create a storage account with encryption disabled, it should be detected.	High	Storage.FC3	Storage.T21 (Low)	Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C104] Verify only authorized Azure Files SMB 2.1 and corresponding settings are configured (e.g. using Azure Policy on audit mode).	Create a storage account with encryption disabled, it should be detected.	High	Storage.FC3	-	Low
Detective (COSO) Protect (NIST CSF)	[Storage.C84] Monitor file shares quotas and trends using Azure Monitor with alarm (e.g. Azure file share size is 80% of capacity)	Create a file with unauthorized or default quota, it should be detected.	Very Low	Storage.FC3	Storage.T16 (Medium)	Low
Directive (COSO) Protect (NIST CSF)	[Storage.C64, depends on Storage.C63, assured by Storage.C67] Ensure authorized keys for Azure storage encryption with desired assignment and rotation policy is set for authorized storage accounts.	Request 1) the mechanism ensuring only authorized keys for Azure storage encryption with desired assignment and rotation policy are in use, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC1	Storage.T14 (Medium)	Low
Directive (COSO) Identify (NIST CSF)	[Storage.C77] Maintain a list of authorized Azure storage region options.	Request the list of authorized Azure storage region, its review process, and its review records.	Low	Storage.FC1	Storage.T14 (Very Low)	Low
Preventative (COSO) Protect (NIST CSF)	[Storage.C79, depends on Storage.C77] Ensure only authorized Azure storage region is set for authorized storage accounts (e.g. using Azure Policy in deny mode).	Create a storage account with unauthorized Azure storage region, it should be denied.	Very Low	Storage.FC1	Storage.T14 (Very Low)	Low
Directive (COSO) Identify (NIST CSF)	[Storage.C32] Maintain an architecture of data Lake storage Gen2 ACL vs IAM based on requirements. Microsoft recommends using Azure Active Directory (Azure AD) to authorize requests against blob and queue data, if possible, instead of Shared Key. Azure AD provides superior security and ease of use over Shared Key.	Check documentation.	Medium	Storage.FC2	Storage.T6 (Very Low) Storage.T7 (Very Low) Storage.T9 (Very Low)	Very Low
Directive (COSO) Protect (NIST CSF)	[Storage.C74, depends on Storage.C73, assured by Storage.C76] Ensure authorized Azure storage redundancy is set for authorized storage accounts.	Request 1) the mechanism ensuring only Azure storage redundancy for storage accounts are in use, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC1	Storage.T14 (Very Low)	Very Low

Assurance (COSO) Detect (NIST CSF)	[Storage.C76] Verify only authorized Azure storage redundancy is set for authorized storage accounts (e.g. using Azure Policy on audit mode).	Configure a storage account with an unauthorized redundancy settings, it should be detected.	High	Storage.FC1	-	Very Low
Directive (COSO) Protect (NIST CSF)	[Storage.C14, depends on Storage.C13, assured by Storage.C16] Ensure storage accounts have soft-delete for the blob enabled for at least the defined minimum retention	Request 1) the mechanism ensuring storage accounts have soft-delete for the blob enabled for at least the defined minimum retention, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	Low	Storage.FC2	Storage.T7 (Very Low) Storage.T9 (Very Low) Storage.T12 (Very Low)	Very Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C16] Verify all storage accounts have soft-delete for the blob enabled (e.g. by using an Azure Policy in audit mode).	Create a storage account without soft-delete for the blob option, it should be detected.	Low	Storage.FC2	-	Very Low
Directive (COSO) Protect (NIST CSF)	[Storage.C17, depends on Storage.C13, assured by Storage.C19] Ensure storage accounts have soft-delete for the container enabled	Request 1) the mechanism ensuring storage accounts have soft-delete for the container enabled, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	Medium	Storage.FC2	Storage.T7 (Very Low) Storage.T9 (Very Low) Storage.T12 (Very Low)	Very Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C19] Verify storage accounts without soft-delete for the container are not configured.	Create a storage account without soft-delete for the container option, it should be detected.	Low	Storage.FC2	-	Very Low
Directive (COSO) Protect (NIST CSF)	[Storage.C78, depends on Storage.C77, assured by Storage.C80] Ensure authorized Azure storage region is set for authorized storage accounts.	Request 1) the mechanism ensuring only Azure storage authorized region for storage accounts are in use, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC1	Storage.T14 (Very Low)	Very Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C80] Verify only authorized Azure storage region is set for authorized storage accounts (e.g. using Azure Policy on audit mode).	Create a storage account with unauthorized Azure storage region, it should be detected.	High	Storage.FC1	-	Very Low
Directive (COSO) Identify (NIST CSF)	[Storage.C96] Maintain a list of authorized CORS per endpoint trusted origins and corresponding settings.	Request the list of authorized storage accounts with CORS trusted origins and corresponding settings, its review process, and its review records.	Low	Storage.FC1	Storage.T26 (Very Low)	Very Low
Directive (COSO) Protect (NIST CSF)	[Storage.C97, depends on Storage.C96, assured by Storage.C99] Ensure only authorized storage accounts have CORS trusted origins and corresponding settings configured.	Request 1) the mechanism ensuring only authorized storage accounts have CORS trusted origins and corresponding settings configured, 2) its records of execution for all new storage accounts, and 3) plan to move any older storage accounts	High	Storage.FC1	Storage.T26 (Low)	Very Low
Preventative (COSO) Protect (NIST CSF)	[Storage.C98, depends on Storage.C96] Prevent unauthorized storage accounts to use CORS trusted origins and corresponding settings (e.g. using Azure Policy in deny mode).	Create a storage account with untrusted CORS settings, it should be denied.	High	Storage.FC1	Storage.T26 (Very Low)	Very Low
Assurance (COSO) Detect (NIST CSF)	[Storage.C99]	Create a storage account with untrusted CORS settings, it should be detected.	High	Storage.FC1	-	Very Low

	Verify only authorized CORS trusted origins and corresponding settings are configured (e.g. using Azure Policy on audit mode).					

Appendix 2 - List of all Actions and their details

Id	Description	Feature Class ID	IAM Permission	Event	API
Storage.A1	Registers the subscription for the storage resource provider and enables the creation of storage accounts.	Storage.FC1	Microsoft.Storage/register/action	TODO	OperationsList
Storage.A2	Notifies Azure Storage that virtual network or subnet is being deleted	Storage.FC1	Microsoft.Storage/locations/deleteVirtualNetworkOrSubnets/action	TODO	NotifiesAzureStorageThatVirtualNetworkOrSubnetIsBeingDeleted
Storage.A3	List blob services	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/read	TODO	Listblobs
Storage.A4	Returns a user delegation key for the blob service	Storage.FC7	Microsoft.Storage/storageAccounts/blobServices/generateUserDelegationKey/action	TODO	ReturnsAUserDelegationKeyForTheblobService
Storage.A5	Returns the result of put blob service properties	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/write	TODO	GetblobProperties
Storage.A6	Returns blob service properties or statistics	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/read	TODO	SetblobServiceProperties
Storage.A7	Returns a blob or a list of blobs	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/read	TODO	Listblobs
Storage.A8	Returns the result of writing a blob	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/write	TODO	ReturnsTheResultOfWritingAblob
Storage.A9	Returns the result of deleting a blob	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/delete	TODO	ReturnsTheResultOfDeletingAblob
Storage.A10	Returns the result of deleting a blob version	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/deleteblobVersion/action	TODO	DeleteblobVersions
Storage.A11	Delete a version of a blob.	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/permanentDelete/action	TODO	DataactionForDeletingAVersionOfAblob
Storage.A12	Returns the result of adding blob content	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/add/action	TODO	AddblobContent
Storage.A13	Returns the list of blobs under an account with matching tags filter	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/filter/action	TODO	ReturnsTheListOfblobsUnderAnAccountWithMatchingTagsFilter

Storage.A14	Moves the blob from one path to another	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/move/action	TODO	Moveblobs
Storage.A15	Changes ownership of the blob	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/manageOwnership/action	TODO	ManageblobOwnership
Storage.A16	Modifies permissions of the blob	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/modifyPermissions/action	TODO	ModifyblobPermissions
Storage.A17	Returns the result of the blob command	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/runAsSuperUser/action	TODO	ReturnsTheResultOfTheblobCommand
Storage.A18	Migrate	Storage.FC1	Microsoft.Storage/storageAccounts/blobServices/containers/migrate/action	TODO	Migrate
Storage.A19	Returns the result of patch blob container	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/write	TODO	PathblobContainer
Storage.A20	Returns the result of deleting a container	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/delete	TODO	DeleteblobContainer
Storage.A21	Returns a container	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/read	TODO	GetblobContainer
Storage.A22	Returns list of containers	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/read	TODO	ReturnsListOfContainers
Storage.A23	Returns the result of leasing blob container	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/lease/action	TODO	ReturnsTheResultOfLeasingblobContainer
Storage.A24	Returns the result of put blob container	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/write	TODO	ReturnsTheResultOfPutblobContainer
Storage.A25	Clear blob container legal hold	Storage.FC6	Microsoft.Storage/storageAccounts/blobServices/containers/clearLegalHold/action	TODO	ClearblobContainerLegalHold
Storage.A26	Set blob container legal hold	Storage.FC6	Microsoft.Storage/storageAccounts/blobServices/containers/setLegalHold/action	TODO	SetblobContainerLegalHold

Storage.A27	Extend blob container immutability policy	Storage.FC6	Microsoft.Storage/storageAccounts/blobServices/containers/immutabilityPolicies/extend/action	TODO	ExtendblobContainerImmutabilityPolicy
Storage.A28	Delete blob container immutability policy	Storage.FC6	Microsoft.Storage/storageAccounts/blobServices/containers/immutabilityPolicies/delete	TODO	DeleteblobContainerImmutabilityPolicy
Storage.A29	Put blob container immutability policy	Storage.FC6	Microsoft.Storage/storageAccounts/blobServices/containers/immutabilityPolicies/write	TODO	PutblobContainerImmutabilityPolicy
Storage.A30	Lock blob container immutability policy	Storage.FC6	Microsoft.Storage/storageAccounts/blobServices/containers/immutabilityPolicies/lock/action	TODO	LockblobContainerImmutabilityPolicy
Storage.A31	Get blob container immutability policy	Storage.FC6	Microsoft.Storage/storageAccounts/blobServices/containers/immutabilityPolicies/read	TODO	GetblobContainerImmutabilityPolicy
Storage.A32	Get queue service properties	Storage.FC4	Microsoft.Storage/storageAccounts/queueServices/read	TODO	GetqueueServiceProperties
Storage.A33	Returns queue service properties or statistics.	Storage.FC4	Microsoft.Storage/storageAccounts/queueServices/read	TODO	ReturnsqueueServicePropertiesOrStatistics.
Storage.A34	Returns the result of setting queue service properties	Storage.FC4	Microsoft.Storage/storageAccounts/queueServices/write	TODO	ReturnsTheResultOfSettingqueueServiceProperties
Storage.A35	Create a queue	Storage.FC4	Microsoft.Storage/storageAccounts/queueServices/queues/write	TODO	CreateAqueue
Storage.A36	Returns a queue or a list of queues.	Storage.FC4	Microsoft.Storage/storageAccounts/queueServices/queues/read	TODO	ReturnsAqueueOrAListOfqueues.
Storage.A37	Returns the result of writing a queue	Storage.FC4	Microsoft.Storage/storageAccounts/queueServices/queues/write	TODO	ReturnsTheResultOfWritingAqueue
Storage.A38	Returns the result of deleting a queue	Storage.FC4	Microsoft.Storage/storageAccounts/queueServices/queues/delete	TODO	ReturnsTheResultOfDeletingAqueue
Storage.A39	Returns a message	Storage.FC4	Microsoft.Storage/storageAccounts/queueServices/queues/messages/read	TODO	ReturnsAMessage
Storage.A40	Returns the result of writing a message	Storage.FC4	Microsoft.Storage/storageAccounts/queueServices/queues/messages/write	TODO	ReturnsTheResultOfWritingAMessage
Storage.A41	Returns the result of deleting a message	Storage.FC4	Microsoft.Storage/storageAccounts/queueServices/queues/messages/delete	TODO	ReturnsTheResultOfDeletingAMessage

Storage.A42	Returns the result of adding a message	Storage.FC4	Microsoft.Storage/storageAccounts/queueServices/queues/messages/add/action	TODO	ReturnsTheResultOfAddingAMessage
Storage.A43	Returns the result of processing a message	Storage.FC4	Microsoft.Storage/storageAccounts/queueServices/queues/messages/process/action	TODO	ReturnsTheResultOfProcessingAMessage
Storage.A44	Update internal properties	Storage.FC1	Microsoft.Storage/storageAccounts/updateInternalProperties/action	TODO	UpdateInternalProperties
Storage.A45	Customer is able to abort an ongoing hierarchical namespace migration on the storage account	Storage.FC1	Microsoft.Storage/storageAccounts/hnsonmigration/action	TODO	CustomerIsAbleToAbortAnOngoingHierarchicalNamespaceMigrationOnTheStorageAccount
Storage.A46	Customer is able to migrate to hierarchical namespace account type	Storage.FC1	Microsoft.Storage/storageAccounts/hnsonmigration/action	TODO	CustomerIsAbleToMigrateToHierarchicalNamespaceAccountType
Storage.A47	Restore blob ranges to the state of the specified time	Storage.FC2	Microsoft.Storage/storageAccounts/restoreblobRanges/action	TODO	RestoreblobRangesToTheStateOfTheSpecifiedTime
Storage.A48	Approve private endpoint Connections	Storage.FC1	Microsoft.Storage/storageAccounts/PrivateEndpointConnectionsApproval/action	TODO	ApprovePrivateEndpointConnections
Storage.A49	Customer is able to control the failover in case of availability issues	Storage.FC1	Microsoft.Storage/storageAccounts/failover/action	TODO	CustomerIsAbleToControlTheFailoverInCaseOfAvailabilityIssues
Storage.A50	Returns the access keys for the specified storage account.	Storage.FC7	Microsoft.Storage/storageAccounts/listkeys/action	TODO	ReturnsTheAccessKeysForTheSpecifiedStorageAccount.
Storage.A51	Regenerates the access keys for the specified storage account.	Storage.FC7	Microsoft.Storage/storageAccounts/regeneratekey/action	TODO	RegeneratesTheAccessKeysForTheSpecifiedStorageAccount.
Storage.A52	Rotate key	Storage.FC7	Microsoft.Storage/storageAccounts/rotateKey/action	TODO	RotateKey
Storage.A53	Revokes all the user delegation keys for the specified storage account.	Storage.FC7	Microsoft.Storage/storageAccounts/revokeUserDelegationKeys/action	TODO	RevokesAllTheUserDelegationKeysForTheSpecifiedStorageAccount.
Storage.A54	Deletes an existing storage account.	Storage.FC1	Microsoft.Storage/storageAccounts/delete	TODO	DeletesAnExistingStorageAccount.
Storage.A55	Returns the list of storage accounts or gets the properties for the specified storage account.	Storage.FC1	Microsoft.Storage/storageAccounts/read	TODO	ReturnsTheListOfStorageAccountsOrGetsThePropertiesForTheSpecifiedStorageAccount.
Storage.A56	Returns the account SAS token for the specified storage account.	Storage.FC1	Microsoft.Storage/storageAccounts/listAccountSas/action	TODO	ReturnsTheAccountSASTokenForTheSpecifiedStorageAccount.
Storage.A57	Returns the service SAS token for the specified storage account.	Storage.FC1	Microsoft.Storage/storageAccounts/listServiceSas/action	TODO	ReturnsTheServiceSASTokenForTheSpecifiedStorageAccount.

Storage.A58	Creates a storage account with the specified parameters, updates the properties or tags, or adds a custom domain for the specified storage account.	Storage.FC1	Microsoft.Storage/storageAccounts/write	TODO	CreatesAStorageAccountWithTheSpecifiedParametersOrUpdateThePropertiesOrTagsOrAddsCustomDomainForTheSpecifiedStorageAccount.
Storage.A59	Create/update storage account diagnostic settings.	Storage.FC1	Microsoft.Storage/storageAccounts/services/diagnosticsettings/write	TODO	Create/UpdateStorageAccountDiagnosticSettings.
Storage.A60	Get list of Azure Storage metrics definitions.	Storage.FC8	Microsoft.Storage/storageAccounts/providers/Microsoft.Insights/metricDefinitions/read	TODO	GetListOfAzureStorageMetricsDefinitions.
Storage.A61	Gets the diagnostic setting for the resource.	Storage.FC8	Microsoft.Storage/storageAccounts/providers/Microsoft.Insights/diagnosticsettings/read	TODO	GetsTheDiagnosticSettingForTheResource.
Storage.A62	Creates or updates the diagnostic setting for the resource.	Storage.FC8	Microsoft.Storage/storageAccounts/providers/Microsoft.Insights/diagnosticsettings/write	TODO	CreatesOrUpdatesTheDiagnosticSettingForTheResource.
Storage.A63	Get list of Azure Storage metrics definitions.	Storage.FC8	Microsoft.Storage/storageAccounts/blobServices/providers/Microsoft.Insights/metricDefinitions/read	TODO	GetListOfAzureStorageMetricsDefinitions.
Storage.A64	Gets the diagnostic setting for the resource.	Storage.FC8	Microsoft.Storage/storageAccounts/blobServices/providers/Microsoft.Insights/diagnosticsettings/read	TODO	GetsTheDiagnosticSettingForTheResource.
Storage.A65	Creates or updates the diagnostic setting for the resource.	Storage.FC8	Microsoft.Storage/storageAccounts/blobServices/providers/Microsoft.Insights/diagnosticsettings/write	TODO	CreatesOrUpdatesTheDiagnosticSettingForTheResource.
Storage.A66	Get list of Azure Storage metrics definitions.	Storage.FC8	Microsoft.Storage/storageAccounts/tableServices/providers/Microsoft.Insights/metricDefinitions/read	TODO	GetListOfAzureStorageMetricsDefinitions.
Storage.A67	Gets the diagnostic setting for the resource.	Storage.FC8	Microsoft.Storage/storageAccounts/tableServices/providers/Microsoft.Insights/diagnosticsettings/read	TODO	GetsTheDiagnosticSettingForTheResource.
Storage.A68	Creates or updates the diagnostic setting for the resource.	Storage.FC8	Microsoft.Storage/storageAccounts/tableServices/providers/Microsoft.Insights/diagnosticsettings/write	TODO	CreatesOrUpdatesTheDiagnosticSettingForTheResource.

Storage.A69	Get list of Azure Storage metrics definitions.	Storage.FC8	Microsoft.Storage/storageAccounts/fileServices/providers/Microsoft.Insights/metricDefinitions/read	TODO	GetListOfAzureStorageMetricsDefinitions.
Storage.A70	Gets the diagnostic setting for the resource.	Storage.FC8	Microsoft.Storage/storageAccounts/fileServices/providers/Microsoft.Insights/diagnosticsettings/read	TODO	GetsTheDiagnosticSettingForTheResource.
Storage.A71	Creates or updates the diagnostic setting for the resource.	Storage.FC8	Microsoft.Storage/storageAccounts/fileServices/providers/Microsoft.Insights/diagnosticsettings/write	TODO	CreatesOrUpdatesTheDiagnosticSettingForTheResource.
Storage.A72	Get list of Azure Storage metrics definitions.	Storage.FC8	Microsoft.Storage/storageAccounts/queueServices/providers/Microsoft.Insights/metricDefinitions/read	TODO	GetListOfAzureStorageMetricsDefinitions.
Storage.A73	Gets the diagnostic setting for the resource.	Storage.FC8	Microsoft.Storage/storageAccounts/queueServices/providers/Microsoft.Insights/diagnosticsettings/read	TODO	GetsTheDiagnosticSettingForTheResource.
Storage.A74	Creates or updates the diagnostic setting for the resource.	Storage.FC8	Microsoft.Storage/storageAccounts/queueServices/providers/Microsoft.Insights/diagnosticsettings/write	TODO	CreatesOrUpdatesTheDiagnosticSettingForTheResource.
Storage.A75	Gets the log definition for table	Storage.FC8	Microsoft.Storage/storageAccounts/tableServices/providers/Microsoft.Insights/logDefinitions/read	TODO	GetsTheLogDefinitionForTable
Storage.A76	Gets the log definition for blob	Storage.FC8	Microsoft.Storage/storageAccounts/blobServices/providers/Microsoft.Insights/logDefinitions/read	TODO	GetsTheLogDefinitionForblob
Storage.A77	Gets the log definition for file	Storage.FC8	Microsoft.Storage/storageAccounts/fileServices/providers/Microsoft.Insights/logDefinitions/read	TODO	GetsTheLogDefinitionForFile
Storage.A78	Gets the log definition for queue	Storage.FC8	Microsoft.Storage/storageAccounts/queueServices/providers/Microsoft.Insights/logDefinitions/read	TODO	GetsTheLogDefinitionForqueue
Storage.A79	Lists the SKUs supported by Azure Storage	Storage.FC1	Microsoft.Storage/skus/read	TODO	ListsTheSkusSupportedByAzureStorage

Storage.A80	Polls the status of an asynchronous operation	Storage.FC1	Microsoft.Storage/operations/read	TODO	PollsTheStatusOfAnAsynchronousOperation
Storage.A81	Checks that account name is valid and is not in use.	Storage.FC1	Microsoft.Storage/checknameavailability/read	TODO	ChecksThatAccountNameIsValidAndIsNotInUse.
Storage.A82	Returns the limit and the current usage count for resources in the specified subscription	Storage.FC1	Microsoft.Storage/locations/usages/read	TODO	ReturnsTheLimitAndTheCurrentUsageCountForResourcesInTheSpecifiedSubscription
Storage.A83	Returns the limit and the current usage count for resources in the specified subscription	Storage.FC1	Microsoft.Storage/usages/read	TODO	ReturnsTheLimitAndTheCurrentUsageCountForResourcesInTheSpecifiedSubscription
Storage.A84	Returns the result of reading blob tags	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/tags/read	TODO	ReturnsTheResultOfReadingblobTags
Storage.A85	Returns the result of writing blob tags	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/tags/write	TODO	ReturnsTheResultOfWritingblobTags
Storage.A86	Delete storage account management policies	Storage.FC1	Microsoft.Storage/storageAccounts/managementPolicies/delete	TODO	DeleteStorageAccountManagementPolicies
Storage.A87	Get storage management account policies	Storage.FC1	Microsoft.Storage/storageAccounts/managementPolicies/read	TODO	GetStorageManagementAccountPolicies
Storage.A88	Put storage account management policies	Storage.FC1	Microsoft.Storage/storageAccounts/managementPolicies/write	TODO	PutStorageAccountManagementPolicies
Storage.A89	Restore file share	Storage.FC3	Microsoft.Storage/storageAccounts/fileServices/shares/action	TODO	RestoreFileShare
Storage.A90	List file services	Storage.FC3	Microsoft.Storage/storageAccounts/fileServices/read	TODO	ListFileServices
Storage.A91	Put file service properties	Storage.FC3	Microsoft.Storage/storageAccounts/fileServices/write	TODO	PutFileServiceProperties
Storage.A92	Get file service properties	Storage.FC3	Microsoft.Storage/storageAccounts/fileServices/read	TODO	GetFileServiceProperties
Storage.A93	Get table service properties	Storage.FC5	Microsoft.Storage/storageAccounts/tableServices/read	TODO	GetTableServiceProperties
Storage.A94	Get table service properties or statistics	Storage.FC5	Microsoft.Storage/storageAccounts/tableServices/read	TODO	GetTableServicePropertiesOrStatistics
Storage.A95	Set table service properties	Storage.FC5	Microsoft.Storage/storageAccounts/tableServices/write	TODO	SetTableServiceProperties
Storage.A96	Returns a file/folder or a list of files/folders	Storage.FC3	Microsoft.Storage/storageAccounts/fileServices/fileshares/files/read	TODO	ReturnsAFile/FolderOrAListOfFiles/Folders

Storage.A97	Returns the result of writing a file or creating a folder	Storage.FC3	Microsoft.Storage/storageAccounts/fileServices/fileshares/files/write	TODO	ReturnsTheResultOfWritingAFileOrCreatingAFolder
Storage.A98	Returns the result of deleting a file/folder	Storage.FC3	Microsoft.Storage/storageAccounts/fileServices/fileshares/files/delete	TODO	ReturnsTheResultOfDeletingAFile/Folder
Storage.A99	Returns the result of modifying permission on a file/folder	Storage.FC3	Microsoft.Storage/storageAccounts/fileServices/fileshares/files/modifypermissions/action	TODO	ReturnsTheResultOfModifyingPermissionOnAFile/Folder
Storage.A100	Get file admin privileges	Storage.FC3	Microsoft.Storage/storageAccounts/fileServices/fileshares/files/actassuperuser/action	TODO	GetFileAdminPrivileges
Storage.A101	Get private endpoint Connection Proxy	Storage.FC1	Microsoft.Storage/storageAccounts/privateEndpointConnectionProxies/read	TODO	GetPrivateEndpointConnectionProxy
Storage.A102	Delete private endpoint Connection Proxies	Storage.FC1	Microsoft.Storage/storageAccounts/privateEndpointConnectionProxies/delete	TODO	DeletePrivateEndpointConnectionProxies
Storage.A103	Put private endpoint Connection Proxies	Storage.FC1	Microsoft.Storage/storageAccounts/privateEndpointConnectionProxies/write	TODO	PutPrivateEndpointConnectionProxies
Storage.A104	List private endpoint Connections	Storage.FC1	Microsoft.Storage/storageAccounts/privateEndpointConnections/read	TODO	ListPrivateEndpointConnections
Storage.A105	Delete private endpoint Connection	Storage.FC1	Microsoft.Storage/storageAccounts/privateEndpointConnections/delete	TODO	DeletePrivateEndpointConnection
Storage.A106	Get private endpoint Connection	Storage.FC1	Microsoft.Storage/storageAccounts/privateEndpointConnections/read	TODO	GetPrivateEndpointConnection
Storage.A107	Put private endpoint Connection	Storage.FC1	Microsoft.Storage/storageAccounts/privateEndpointConnections/write	TODO	PutPrivateEndpointConnection
Storage.A108	Get StorageAccount groupids	Storage.FC1	Microsoft.Storage/storageAccounts/privateLinkResources/read	TODO	GetStorageaccountGroupids
Storage.A109	Checks that account name is valid and is not in use.	Storage.FC1	Microsoft.Storage/locations/checknameavailability/read	TODO	ChecksThatAccountNameIsValidAndIsNotInUse.
Storage.A110	Delete file share	Storage.FC3	Microsoft.Storage/storageAccounts/fileServices/shares/delete	TODO	DeleteFileShare
Storage.A111	Get file share	Storage.FC3	Microsoft.Storage/storageAccounts/fileServices/shares/read	TODO	GetFileShare

Storage.A112	List file shares	Storage.FC3	Microsoft.Storage/storageAccounts/fileServices/shares/read	TODO	ListFileShares
Storage.A113	Create or update file share	Storage.FC3	Microsoft.Storage/storageAccounts/fileServices/shares/write	TODO	CreateOrUpdateFileShare
Storage.A114	Encryption	Storage.FC9	Microsoft.Storage/storageAccounts/encryptionScopes/read	TODO	Encryption
Storage.A115	Encryption	Storage.FC9	Microsoft.Storage/storageAccounts/encryptionScopes/write	TODO	Encryption
Storage.A116	Delete object replication policy	Storage.FC9	Microsoft.Storage/storageAccounts/objectReplicationPolicies/delete	TODO	DeleteObjectReplicationPolicy
Storage.A117	Get object replication policy	Storage.FC9	Microsoft.Storage/storageAccounts/objectReplicationPolicies/read	TODO	GetObjectReplicationPolicy
Storage.A118	List object replication policies	Storage.FC9	Microsoft.Storage/storageAccounts/objectReplicationPolicies/read	TODO	ListObjectReplicationPolicies
Storage.A119	Create or update object replication policy	Storage.FC9	Microsoft.Storage/storageAccounts/objectReplicationPolicies/write	TODO	CreateOrUpdateObjectReplicationPolicy
Storage.A120	Share policy	Storage.FC1	Microsoft.Storage/storageAccounts/dataSharePolicies/delete	TODO	SharePolicy
Storage.A121	Share policy	Storage.FC1	Microsoft.Storage/storageAccounts/dataSharePolicies/read	TODO	SharePolicy
Storage.A122	Share policy	Storage.FC1	Microsoft.Storage/storageAccounts/dataSharePolicies/write	TODO	SharePolicy
Storage.A123	Delete local user	Storage.FC1	Microsoft.Storage/storageAccounts/localUsers/delete	TODO	DeleteLocalUser
Storage.A125	List local user keys	Storage.FC7	Microsoft.Storage/storageAccounts/localusers/listKeys/action	TODO	ListLocalUserKeys
Storage.A126	List local users	Storage.FC1	Microsoft.Storage/storageAccounts/localusers/read	TODO	ListLocalUsers
Storage.A127	Get local user	Storage.FC1	Microsoft.Storage/storageAccounts/localusers/read	TODO	GetLocalUser
Storage.A128	Create or update local user	Storage.FC1	Microsoft.Storage/storageAccounts/localusers/write	TODO	CreateOrUpdateLocalUser
Storage.A129	Query tables	Storage.FC5	Microsoft.Storage/storageAccounts/tableServices/tables/read	TODO	QueryTables
Storage.A130	Create tables	Storage.FC5	Microsoft.Storage/storageAccounts/tableServices/tables/write	TODO	CreateTables

Storage.A131	Delete tables	Storage.FC5	Microsoft.Storage/storageAccounts/tableServices/tables/delete	TODO	DeleteTables
Storage.A132	Policies read	Storage.FC10	Microsoft.Storage/storageAccounts/inventoryPolicies/delete	TODO	PoliciesRead
Storage.A134	Policies write	Storage.FC10	Microsoft.Storage/storageAccounts/inventoryPolicies/write	TODO	PoliciesWrite
Storage.A135	Delete lock	Storage.FC1	Microsoft.Storage/storageAccounts/accountLocks/deleteLock/action	TODO	DeleteLock
Storage.A136	Lock read	Storage.FC1	Microsoft.Storage/storageAccounts/accountLocks/read	TODO	LockRead
Storage.A137	Lock write	Storage.FC1	Microsoft.Storage/storageAccounts/accountLocks/write	TODO	LockWrite
Storage.A138	Lock delete	Storage.FC1	Microsoft.Storage/storageAccounts/accountLocks/delete	TODO	LockDelete
Storage.A139	Data share policy read	Storage.FC1	Microsoft.Storage/storageAccounts/consumerdataSharePolicies/read	TODO	DataSharePolicyRead
Storage.A140	Data share policy write	Storage.FC1	Microsoft.Storage/storageAccounts/consumerdataSharePolicies/write	TODO	DataSharePolicyWrite
Storage.A141	Query table entities	Storage.FC5	Microsoft.Storage/storageAccounts/tableServices/tables/entities/read	TODO	QueryTableEntities
Storage.A142	Insert, merge, or replace table entities	Storage.FC5	Microsoft.Storage/storageAccounts/tableServices/tables/entities/write	TODO	Insert Merge OrReplaceTableEntities
Storage.A143	Delete table entities	Storage.FC5	Microsoft.Storage/storageAccounts/tableServices/tables/entities/delete	TODO	DeleteTableEntities
Storage.A144	Insert table entities	Storage.FC5	Microsoft.Storage/storageAccounts/tableServices/tables/entities/add/action	TODO	InsertTableEntities
Storage.A145	Merge or update table entities	Storage.FC5	Microsoft.Storage/storageAccounts/tableServices/tables/entities/update/action	TODO	MergeOrUpdateTableEntities
Storage.A146	Run as Super user	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/immutableStorage/runAsSuperUser/action	TODO	RunAsSuperUser

Storage.A147	Point markers	Storage.FC1	Microsoft.Storage/storageAccounts/objectReplicationPolicies/restorePointMarkers/write	TODO	PointMarkers
Storage.A148	Restore point delete	Storage.FC1	Microsoft.Storage/storageAccounts/restorePoints/delete	TODO	RestorePointDelete
Storage.A149	Restore point read	Storage.FC1	Microsoft.Storage/storageAccounts/restorePoints/read	TODO	RestorePointRead
Storage.A150	Blob service read	Storage.FC1	Microsoft.Storage/storageAccounts/restorePoints/read	TODO	blobServiceRead
Storage.A151	Blob service write	Storage.FC1	Microsoft.Storage/storageAccounts/accountMigrations/read	TODO	blobServiceWrite
Storage.A152	Manage storage account migration to enable hierarchical namespace.	Storage.FC1	Microsoft.Storage/storageAccounts/accountMigrations/write	TODO	ContainerRead
Storage.A153	List filesystems and their properties in given account.	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/read	TODO	Filesystem_List
Storage.A154	Create a filesystem rooted at the specified location. If the filesystem already exists, the operation fails. This operation does not support conditional HTTP requests.	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/write	TODO	Filesystem_Create
Storage.A155	Set properties for the filesystem. This operation supports conditional HTTP requests.	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/write	TODO	Filesystem_Setproperties
Storage.A156	List filesystem paths and their properties.	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/read	TODO	Path_List
Storage.A157	Get all system and user-defined filesystem properties are specified in the response headers.	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/read	TODO	Filesystem_Getproperties
Storage.A158	Marks the filesystem for deletion. When a filesystem is deleted, a filesystem with the same identifier cannot be created for at least 30 seconds. While the filesystem is being deleted, attempts to create a filesystem with the same identifier will fail with status code 409 (Conflict), with the service returning additional error information indicating that the filesystem is being deleted. Get all other operations, including operations on any files or directories within the filesystem, will fail with status code 404 while the filesystem is being deleted. This operation supports conditional HTTP requests.	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/delete	TODO	Filesystem_Delete
Storage.A159	Create or rename a file or directory. By default, the destination is overwritten and if the destination already exists and has a lease the lease is broken. This operation supports conditional HTTP requests.	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/write	TODO	Path_Create
Storage.A160	Uploads data to be appended to a file, flushes (writes) previously uploaded data to a file, sets properties for a file or directory, or sets access control for a file or directory. Data can only be appended to a file. This operation supports conditional HTTP requests.	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/write	TODO	Path_Update

Storage.A161	Create and manage a lease to restrict write and delete access to the path. This operation supports conditional HTTP requests.	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/write	TODO	Path_Lease
Storage.A162	Read the contents of a file. For read operations, range requests are supported. This operation supports conditional HTTP requests.	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/read	TODO	Path_Read
Storage.A163	Get properties returns all system and user defined properties for a path. Get status returns all system defined properties for a path. Get Access Control List returns the access control list for a path. This operation supports conditional HTTP requests.	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/read	TODO	Path_Getproperties
Storage.A164	Delete the file or directory. This operation supports conditional HTTP requests.	Storage.FC2	Microsoft.Storage/storageAccounts/blobServices/containers/blobs/delete	TODO	Path_Delete