



## Azure Application Security

Protect Your Applications in the Cloud

December/2022



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Cloud Consultant and Trainer



@zaalion





# Course Repository

<https://github.com/zaalion/oreilly-azure-app-security>



master

2 branches

0 tags

Go to file

Add file

<> Code



### Your master branch isn't protected

Protect this branch from force pushing, deletion, or require status checks before merging



clean up



.gitattributes

Initial checkin



.gitignore

slide deck



resources.txt

references

Help people interested in this repository understand your project by adding a

Local

Codespaces New

Clone

HTTPS

SSH

GitHub CLI

<https://github.com/zaalion/oreilly-azure-app->



Use Git or checkout with SVN using the web URL.

Open with GitHub Desktop

Open with Visual Studio

Download ZIP



EXAMS

## Exam AZ-500: Microsoft Azure Security Technologies



Candidates for this exam should have subject matter expertise implementing Azure security controls that protect identity, access, data, applications, and networks in cloud and hybrid environments as part of an end-to-end infrastructure.

Responsibilities for an Azure security engineer include managing the security posture, identifying and remediating vulnerabilities, performing threat modeling, implementing threat protection, and responding to security incident escalations.

Azure security engineers often serve as part of a larger team to plan and implement cloud-based management and security.

Candidates for this exam should have practical experience in administration of Azure and hybrid environments. Candidates should have experience with infrastructure as code, security operations processes, cloud capabilities, and Azure services.

You may be eligible for ACE college credit if you pass this certification exam. See [ACE college credit for certification exams](#) for details.

① Important

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#### 📌 Important

The English language version of this exam was updated on August 2, 2022. Please download the study guide listed in the "Tip" box to see the current skills measured. If a localized version of this exam is available, it will be updated approximately eight weeks after this date.

Passing score: 700. [Learn more about exam scores.](#)

#### 💡 Tip

- Watch [AZ-500 Exam Prep videos](#) on Learn
- Download the [AZ-500 study guide](#) to help you prepare for the exam
- Demo the exam experience by visiting our [Exam Sandbox](#)

**Part of the requirements for:** [Microsoft Certified: Azure Security Engineer Associate](#)

**Related exams:** none

**Important:** [See details](#)

[Go to Certification Dashboard](#)

## Schedule exam

### Exam AZ-500: Microsoft Azure Security Technologies

**Languages:** English, Japanese, Chinese (Simplified), Korean, German, French, Spanish, Portuguese (Brazil), Arabic (Saudi Arabia), Russian, Chinese (Traditional), Italian, Indonesian (Indonesia)

**Retirement date:** none

United States

**\$165 USD\***

Price based on the country or region in which the exam is proctored.

## Two ways to prepare

Online - Free

Instructor-led - Paid

### Items in this collection



LEARNING PATH

AZ-500: Manage Identity and Access

5 Modules

Intermediate

Security Engineer

Azure

Start >

+ Save



LEARNING PATH

AZ-500: Implement platform protection

4 Modules

Intermediate

Administrator

Azure

+ Save



LEARNING PATH

AZ-500: Secure your data and applications

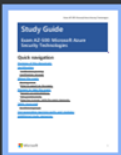
4 Modules

Intermediate

Administrator

Azure

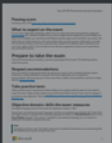
+ Save



1



2



3



4

*Exam AZ-500: Microsoft Azure Security Technologies*

# Study Guide

## Exam AZ-500: Microsoft Azure Security Technologies

### Quick navigation

[Purpose of this document](#)[Certification](#)[Certification journey](#)[Certification renewal](#)[About the exam](#)[Passing score](#)[What to expect on the exam](#)[Prepare to take the exam](#)[Request accommodations](#)[Take practice tests](#)[Objective domain: skills the exam measures](#)[Skills measured](#)[Functional groups](#)[Corresponding learning paths and modules](#)[Additional study resources](#)



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# Manage Azure Active Directory (Azure AD) Identities

- Create and manage a managed identity for Azure resources



## Create a virtual machine

[Basics](#)[Disks](#)[Networking](#)[Management](#)[Guest config](#)[Tags](#)[Review + create](#)

Configure monitoring and management options for your VM.

### MONITORING

Boot diagnostics ⓘ

☒ On ☐ Off

OS guest diagnostics ⓘ

☐ On ☒ Off

\* Diagnostics storage account ⓘ

azurefunctions12941ee6



[Create new](#)

### IDENTITY

Managed service identity ⓘ

☒ On ☐ Off

### AUTO-SHUTDOWN

Enable auto-shutdown ⓘ

☐ On ☒ Off

### BACKUP

Enable backup ⓘ

☐ On ☒ Off



# Create User Assigned Managed Identity ...

**Basics**   Tags   Review + create

## Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription \* ⓘ

Pay-As-You-Go



Resource group \* ⓘ



[Create new](#)

## Instance details

Region \* ⓘ

West US



Name \* ⓘ

Filter by title

Managed identities for Azure resources

> Overview

> Quickstarts

> Tutorials

> Concepts

> How-to guides

> Reference

> Resources

Frequently asked questions

Known issues

Azure services that support managed identities for Azure resources

Azure services that support Azure Active Directory authentication

Stack Overflow

Azure AD Developers forum

Docs / Azure / Active Directory / Managed identities for Azure resources /

⊕ ⌨ ✎ ⋮

# Azure services that can use managed identities to access other services

Article • 08/17/2022 • 3 minutes to read • 15 contributors

👍 🗨

Managed identities for Azure resources provide Azure services with an automatically managed identity in Azure Active Directory. Using a managed identity, you can authenticate to any [service that supports Azure AD authentication](#) without managing credentials. We are integrating managed identities for Azure resources and Azure AD authentication across Azure. This page provides links to services' content that can use managed identities to access other Azure resources. Each entry in the table includes a link to service documentation discussing managed identities.

## Important

New technical content is added daily. This list does not include every article that talks about managed identities. Please refer to each service's content set for details on their managed identities support. Resource provider namespace information is available in the article titled [Resource providers for Azure services](#).

The following Azure services support managed identities for Azure resources:

| Service Name        | Documentation  |
|---------------------|--|
| API Management      | <a href="#">Use managed identities in Azure API Management</a> |
| Application Gateway | <a href="#">TLS termination with Key Vault certificates</a>    |

In this article

Next steps

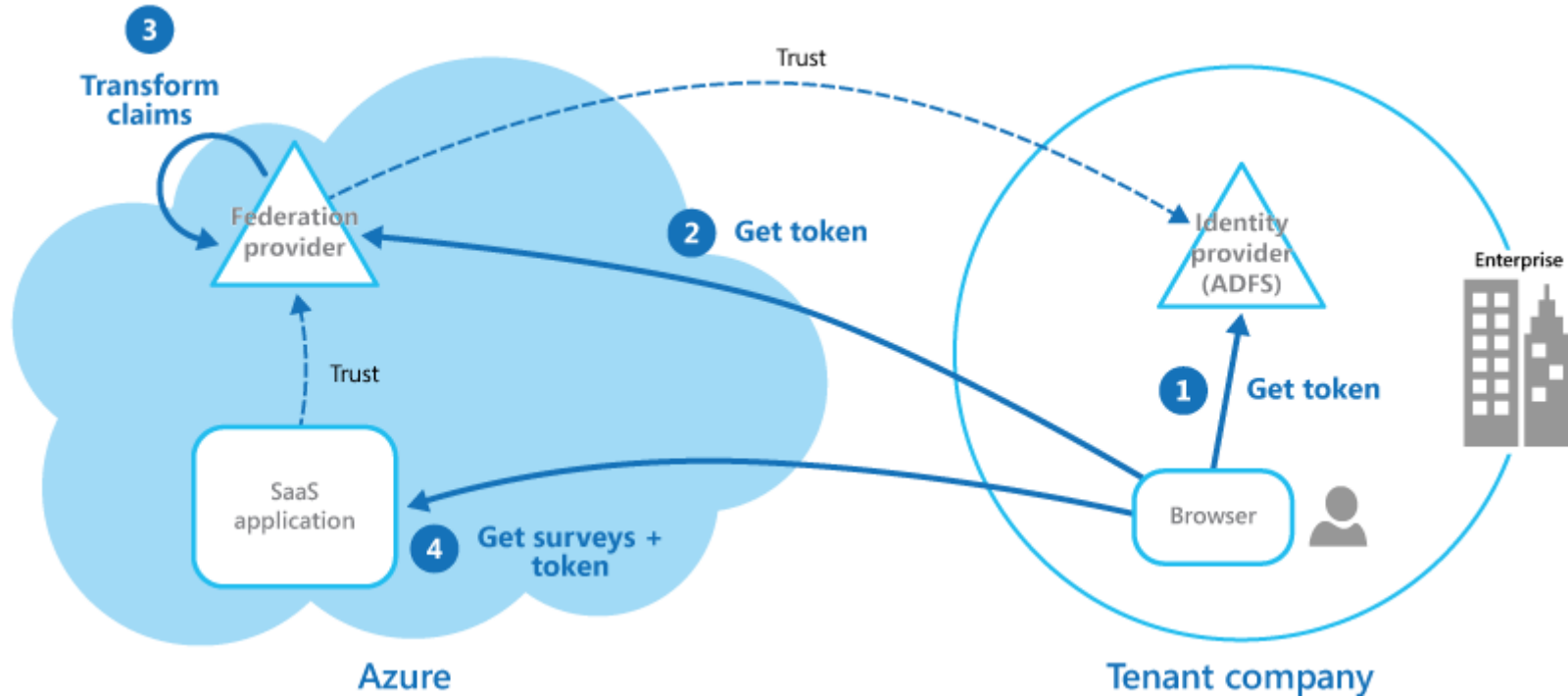
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# Manage Application Access

- Create an app registration
- Configure app registration permission scopes
- Manage app registration permission consent
- Manage API permissions to Azure subscriptions and resources
- Configure an authentication method for a service principal



# Federated Identity Pattern and SSO








# Default Directory | App registrations


Azure Active Directory

- Overview
- Preview features
- Diagnose and solve problems


## Manage


- Users
- Groups
- External Identities
- Roles and administrators
- Administrative units
- Enterprise applications
- Devices
- App registrations**
- Identity Governance

+ New registration  Endpoints  Troubleshooting  Refresh  Download  Preview features


 Starting June 30th, 2020 we will no longer add any new features to Azure Active Directory Authentication Library (ADAL) and technical support and security updates but we will no longer provide feature updates. Applications will need to be upgraded to Microsoft Graph. [Learn more](#)

All applications **Owned applications** Deleted applications Applications from personal account

 Start typing a display name or application (client) ID to filter these r...

 Add filters

3 applications found

Display name 

Application (client) ID

|    |                |                               |
|----|----------------|-------------------------------|
| AP | app-databricks | 545d1750-6a27-45-9456-fa43724 |
| ID | identitydms    | a8e7964b-6a27-45-9456-fa43724 |
| KV | kvdenisapp     | d9c2d532-c1d2-45-9456-fa43724 |



① testuser@fourthcoffeetest.onmicrosoft.com

## ② Permissions requested



Best Practices Demo ④

Fabrikam, Inc. ⑤

Microsoft 365 Certified ⑥

**This application is not published by Microsoft.** ⑦

This app would like to:

✓ Have full access to your calendars

^ View your basic profile

- ⑨ { Allows the app to see your basic profile (name, picture, user name) ⑧  
This is a permission requested to access your data in Fourth Coffee.  
✓ Maintain access to data you have given it access to

Accepting these permissions means that you allow this app to use your data as specified in their terms of service and privacy statement. **The publisher has not provided links to their terms for you to review.** You can change these permissions at <https://myapps.microsoft.com>. ⑩


Only accept if you trust the publisher and if you selected this app from a store or website you trust. Ask your admin if you're not sure. Microsoft is not involved in licensing this app to you. [Hide details](#)

Does this app look suspicious? [Report it here](#)





# app-databricks | API permissions ...




 Search (Ctrl+/)













 Refresh


 | 

 Got feedback?

-  Overview
-  Quickstart
-  Integration assistant


## Manage


-  Branding & properties
-  Authentication
-  Certificates & secrets
-  Token configuration
-  API permissions
-  Expose an API
-  App roles
-  Owners
-  Roles and administrators
-  Manifest

 The "Admin consent required" column shows the default value for an organization. However, user consent can be customized per permission, user, or app. To learn more, click the link below. [Learn more](#)

## Configured permissions

Applications are authorized to call APIs when they are granted permissions by users/admins as part of the consent process. The list of configured permissions shows all the permissions the application needs. [Learn more about permissions and consent](#)

 Add a permission

 Grant admin consent for Default Directory

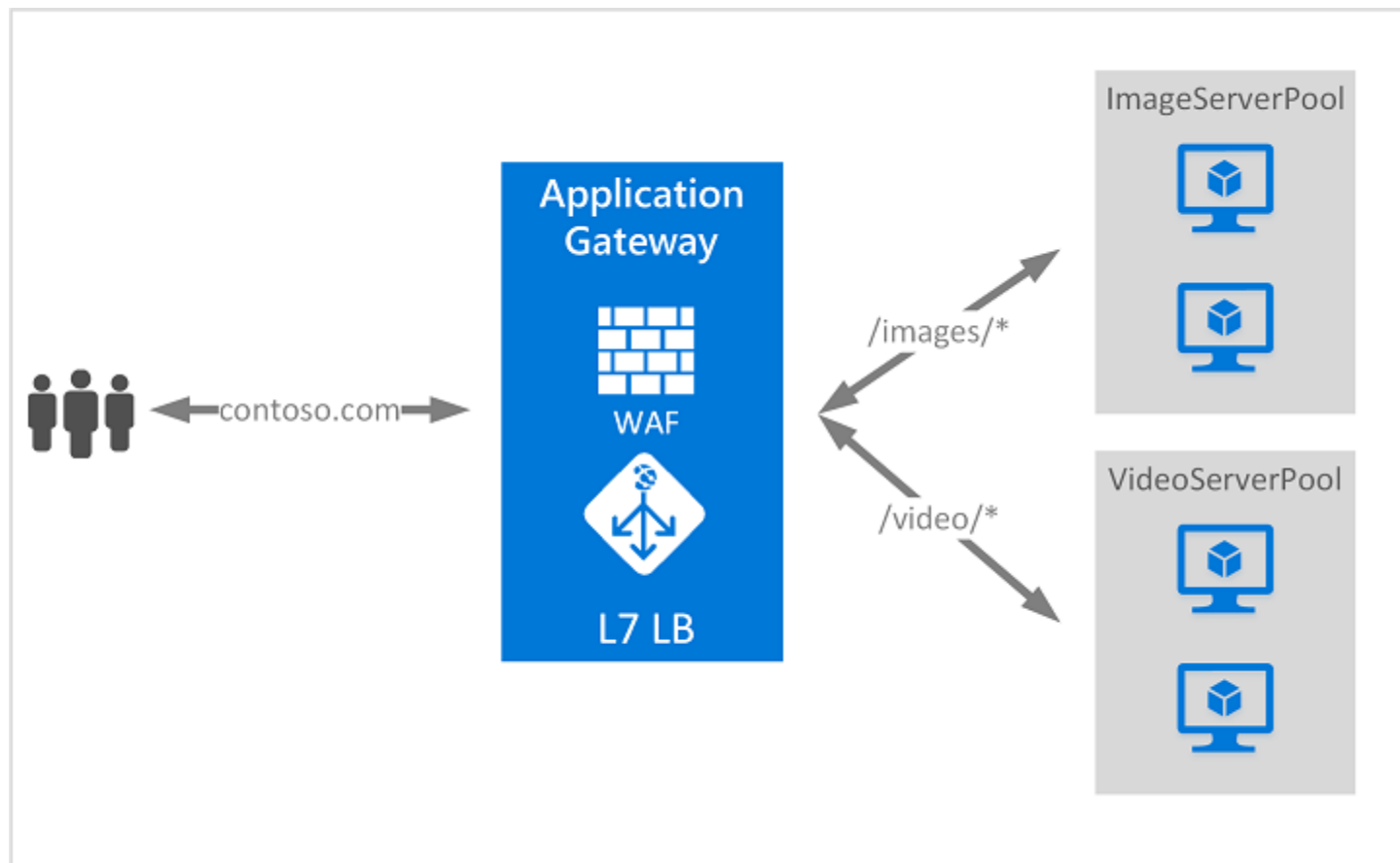
| API / Permissions name | Type      | Description                   | Admin consent required | Status |
|------------------------|-----------|-------------------------------|------------------------|--------|
| Microsoft Graph (1)    |           |                               |                        |        |
| User.Read              | Delegated | Sign in and read user profile | No                     |        |

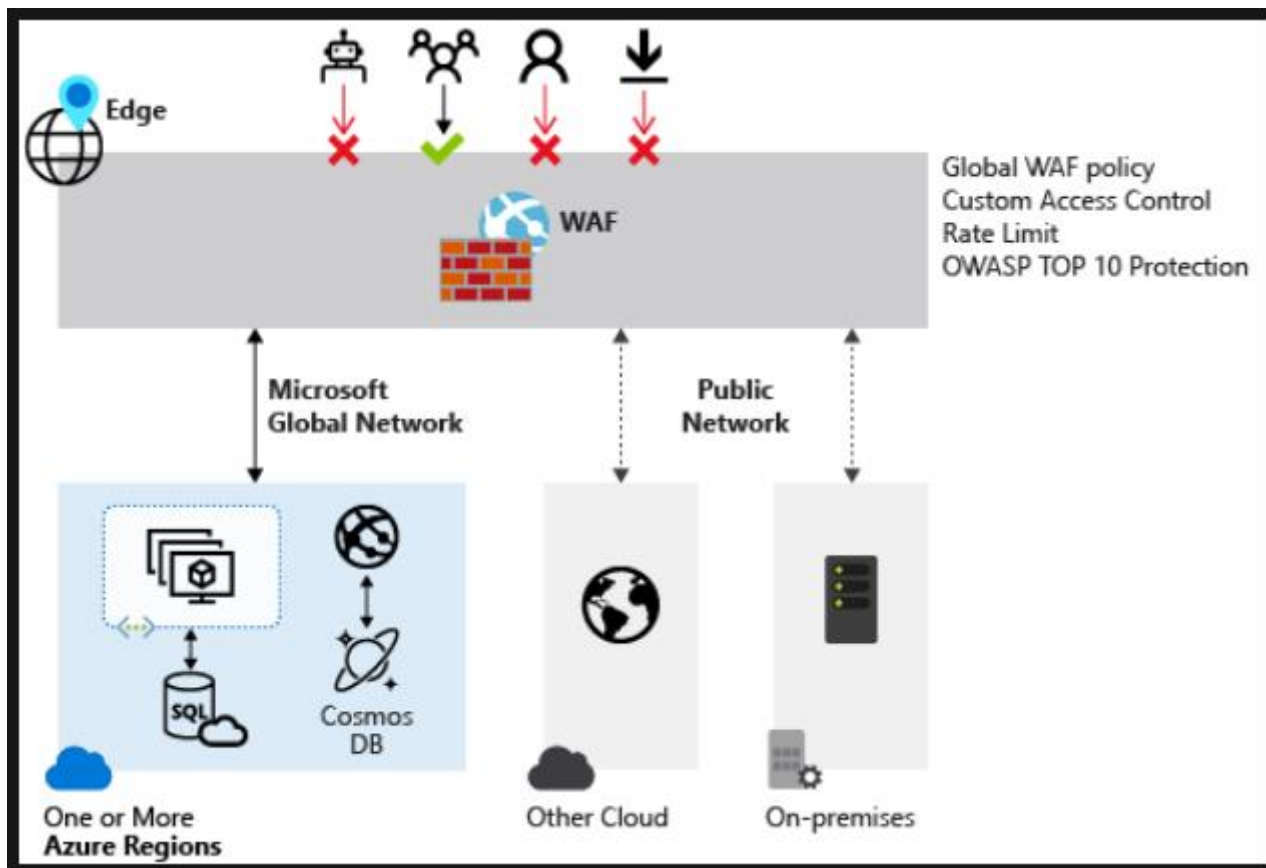
To view and manage permissions and user consent, try [Enterprise applications](#).

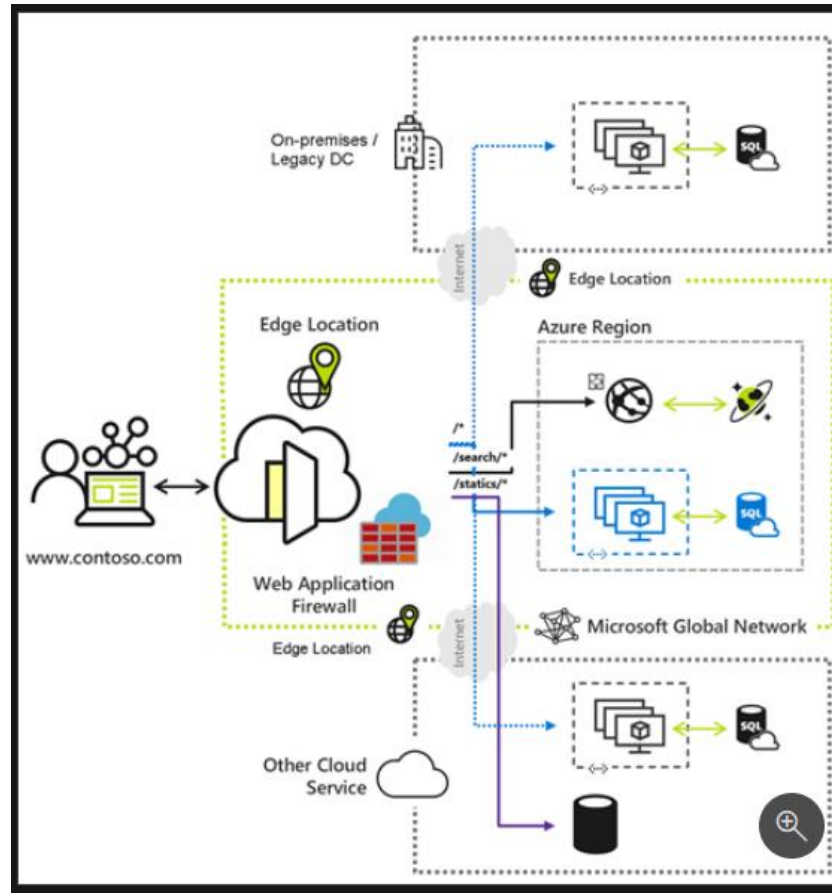
# Implement Advanced Network Security

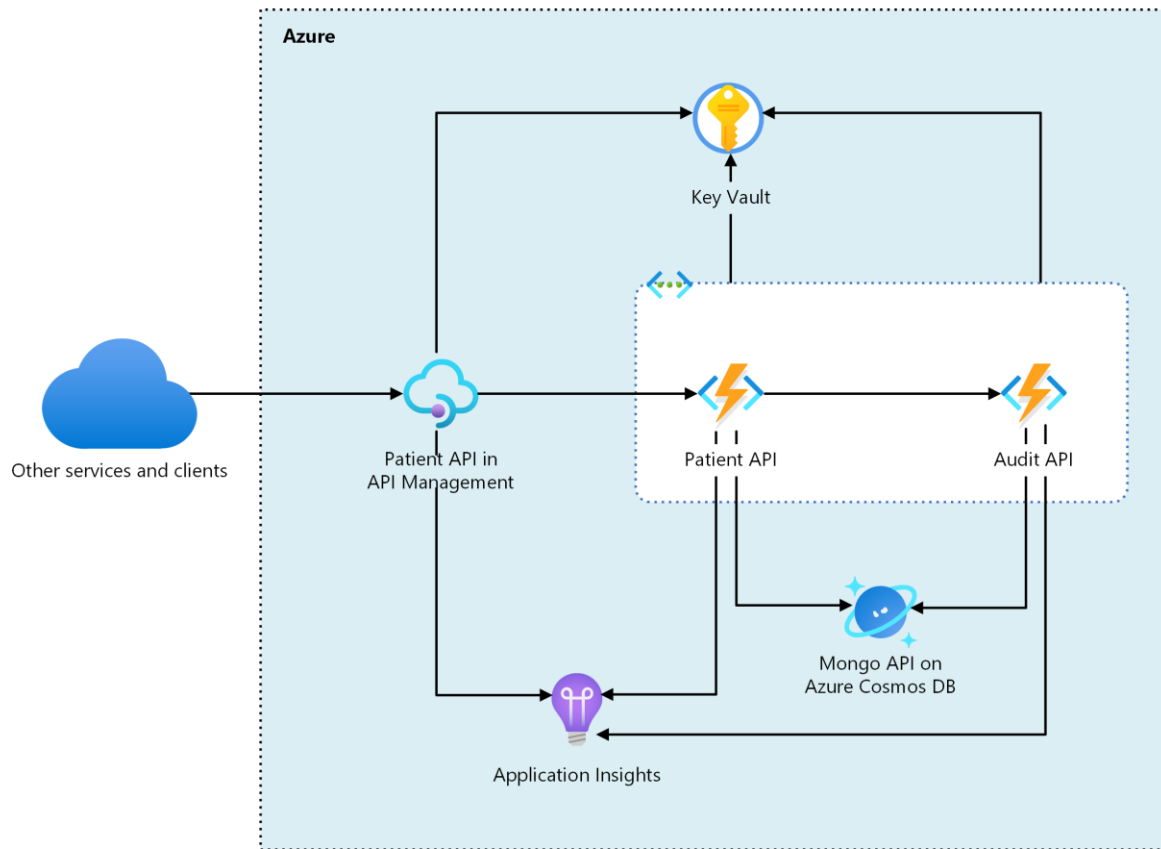
- Secure the connectivity of virtual networks
- Create and configure Azure Application Gateway
- Create and configure Azure Front Door
- Create and configure Web Application Firewall (WAF)
- Configure a resource firewall, including storage account, Azure SQL, Azure Key Vault, or Azure App Service
- Configure network isolation for Web Apps and Azure Functions
- Implement Azure Service Endpoints
- Implement Azure Private Endpoints, including integrating with other services
- Implement Azure Private Links

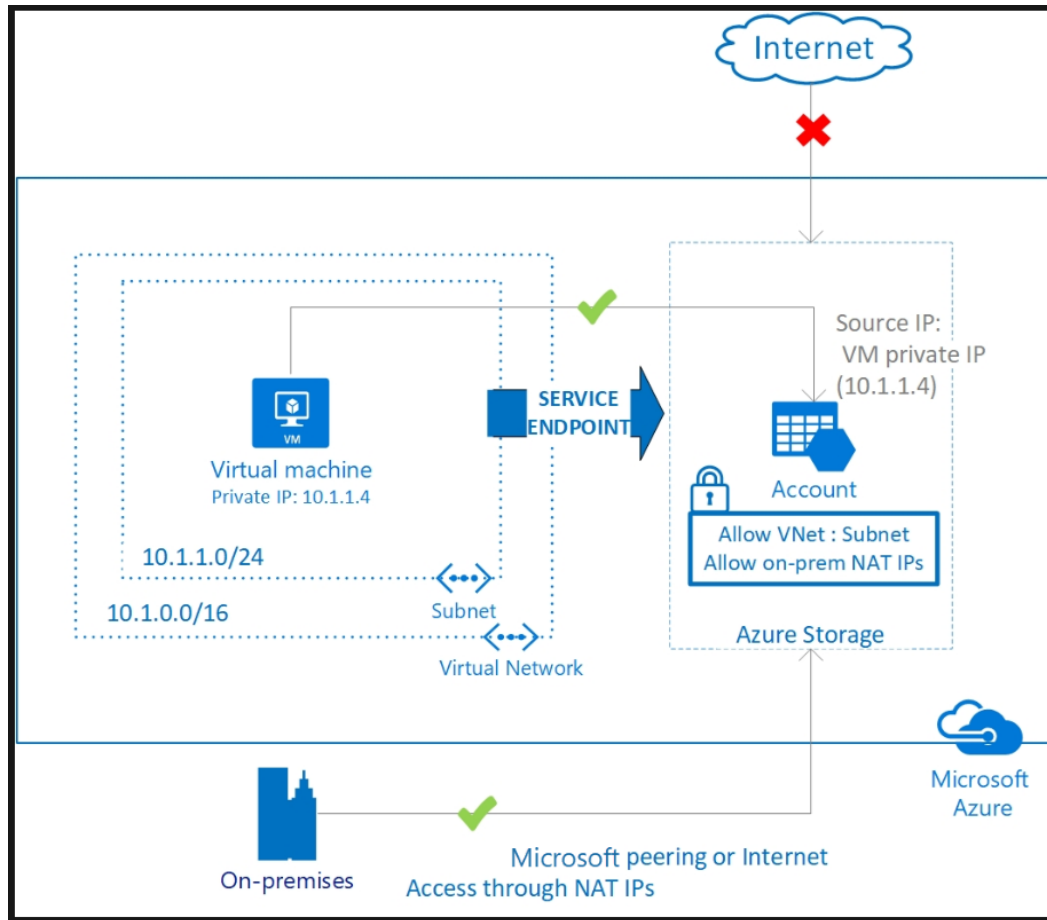













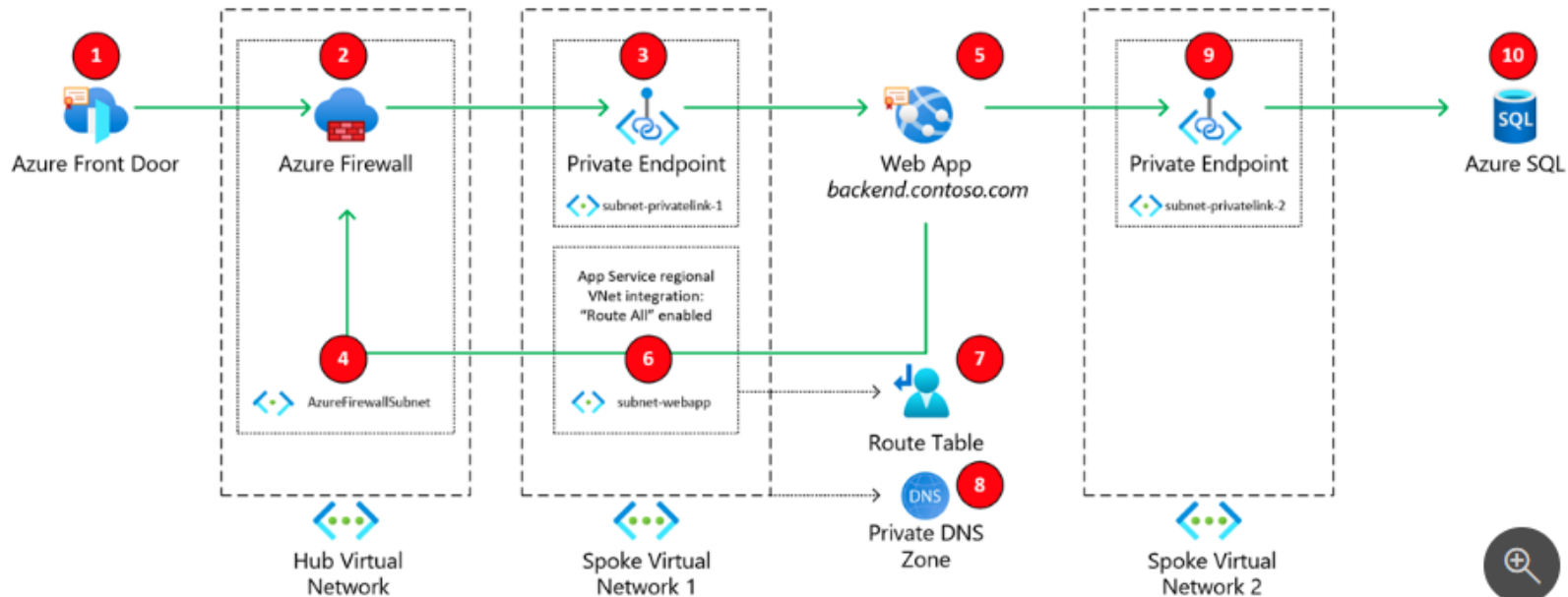


#### ⓘ Note

Microsoft recommends use of Azure Private Link for secure and private access to services hosted on Azure platform. For more information, see [Azure Private Link](#).







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# Configure Advanced Security for Compute

- Configure security for container services
- Manage access to Azure Container Registry
- Configure security for serverless compute
- Configure security for an Azure App Service
- Configure encryption at rest
- Configure encryption in transit



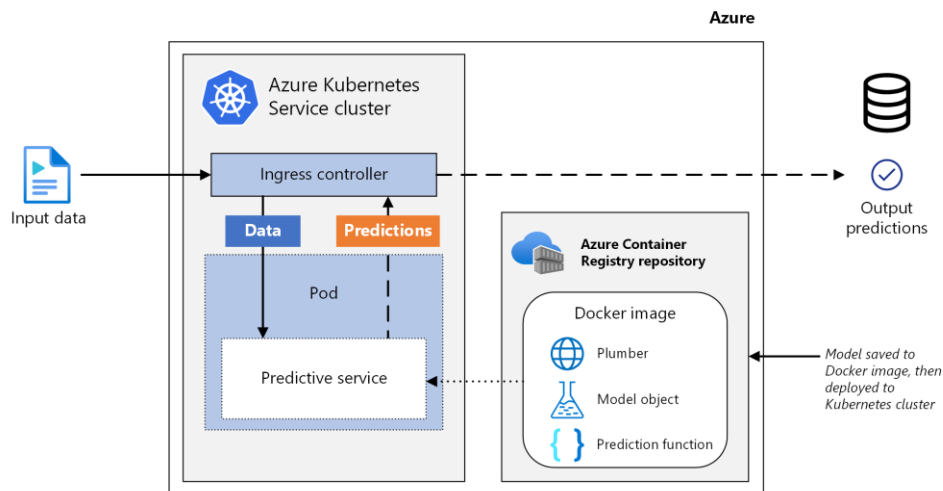
# Configure Security for Container Services

- Security considerations for Azure Container Instances
- Azure security baseline for Container Instances
- Security concepts for Azure Kubernetes Service (AKS)
- Authentication and authorization in Azure Container Apps



# Manage Access to Azure Container Registry

- Authenticate with an Azure container registry
- Azure Container Registry roles and permissions



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# Configure Security for Serverless Compute

- Secure access and data in Azure Logic Apps
- Secure Azure Functions



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# Configure Security for an Azure App Service

- [Security in Azure App Service](#)
- [Security recommendations for App Service](#)
- [Azure security baseline for App Service](#)



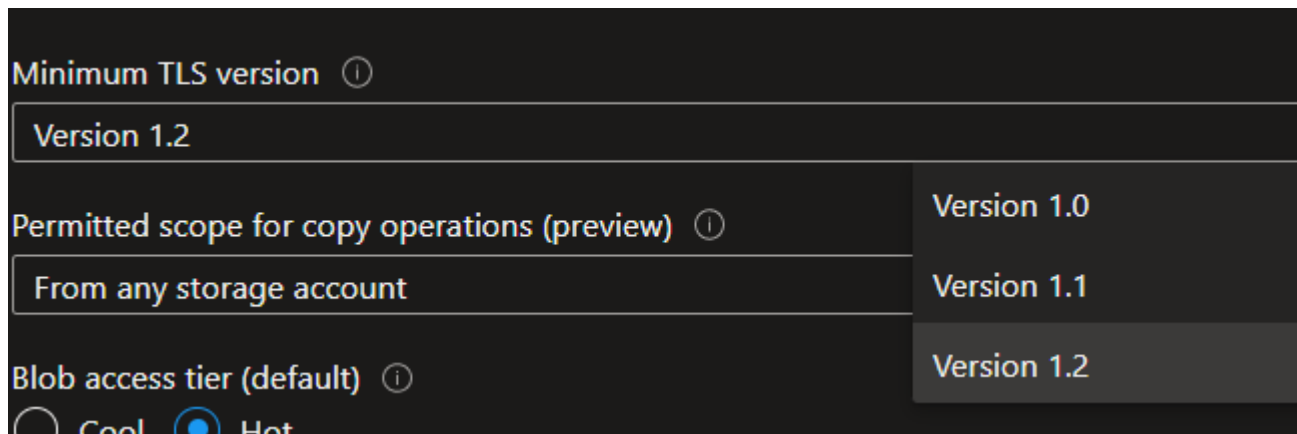
# Configure Encryption at Rest

- Azure Data Encryption at rest
- Azure Storage encryption for data at rest
- Data encryption in Azure Cosmos DB



# Configure Encryption in Transit

- Encryption of data in transit



The screenshot shows the 'Encryption in transit' configuration page for an Azure Storage account. It features three settings, each with an information icon (i) to its right:

- Minimum TLS version**: A dropdown menu is open, showing 'Version 1.2' as the selected option. Other visible options are 'Version 1.0' and 'Version 1.1'.
- Permitted scope for copy operations (preview)**: A dropdown menu is open, showing 'From any storage account' as the selected option.
- Blob access tier (default)**: Two radio buttons are visible: 'Cool' (unselected) and 'Hot' (selected).





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# Configure Security for Storage

- Configure access control for storage accounts
- Configure storage account access keys
- Configure Azure AD authentication for Azure Blobs and Azure Files
- Configure delegated access



| Azure artifact     | Shared Key (storage account key) | Shared access signature (SAS) | Azure Active Directory (Azure AD)        | On-premises Active Directory Domain Services      | Anonymous public read access | Storage Local Users      |
|--------------------|----------------------------------|-------------------------------|--|---|------------------------------|--------------------------|
| Azure Blobs        | Supported                        | Supported                     | Supported                                | Not supported                                     | Supported                    | Supported, only for SFTP |
| Azure Files (SMB)  | Supported                        | Not supported                 | Supported, only with AAD Domain Services | Supported, credentials must be synced to Azure AD | Not supported                | Supported                |
| Azure Files (REST) | Supported                        | Supported                     | Not supported                            | Not supported                                     | Not supported                | Not supported            |
| Azure Queues       | Supported                        | Supported                     | Supported                                | Not Supported                                     | Not supported                | Not supported            |
| Azure Tables       | Supported                        | Supported                     | Supported                                | Not supported                                     | Not supported                | Not supported            |





All mobile-phone  
call metadata

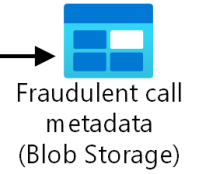
1

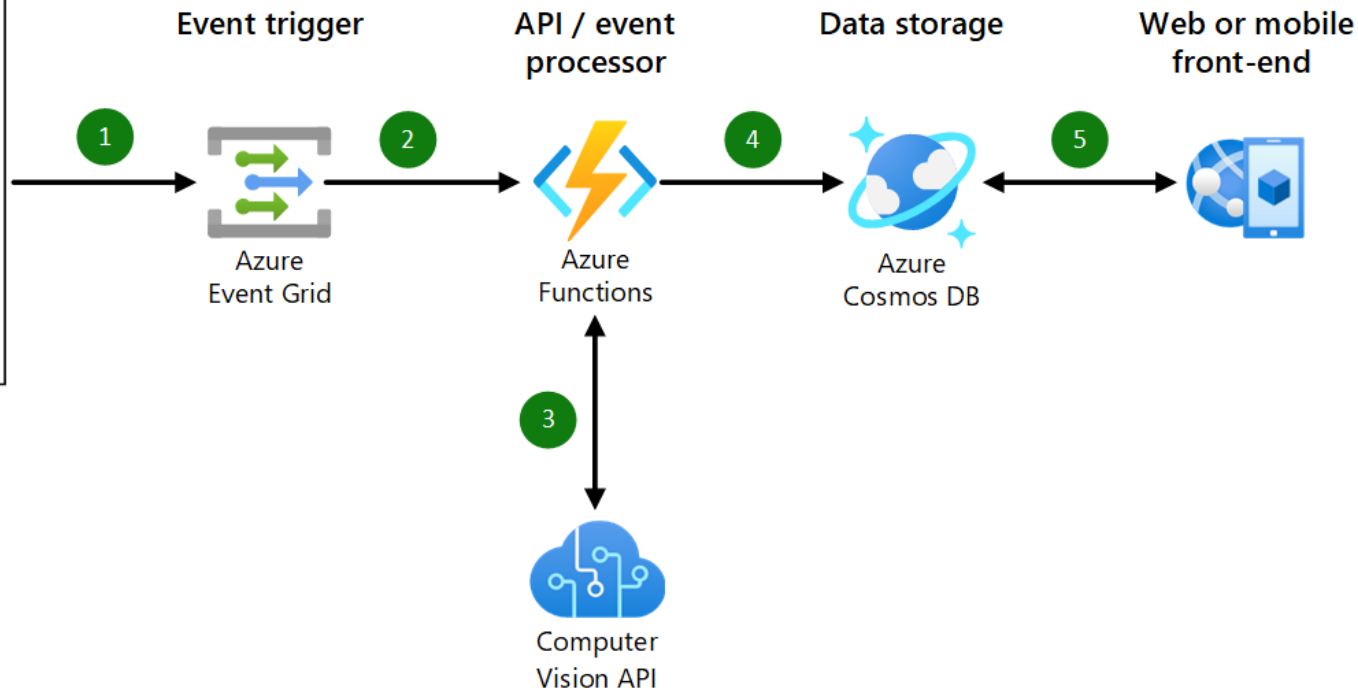
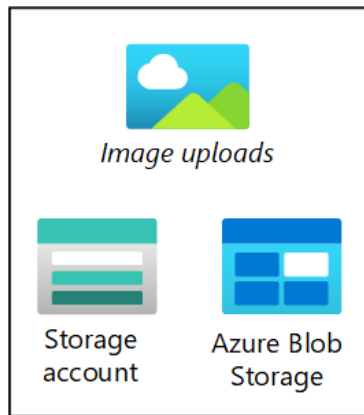


2



4





Microsoft  
Azure



## 4a | Shared access signature



A shared access signature (SAS) is a URI that grants restricted access rights to Azure Storage resources. You can provide a shared access signature to clients who should not be trusted with your storage account key but whom you wish to delegate access to certain storage account resources. By distributing a shared access signature URI to these clients, you grant them access to a resource for a specified period of time.

An account-level SAS can delegate access to multiple storage services (i.e. blob, file, queue, table). Note that stored access policies are currently not supported for an account-level SAS.

[Learn more about creating an account SAS](#)

### Allowed services ⓘ

☒ Blob ☒ File ☒ Queue ☒ Table

### Allowed resource types ⓘ

☐ Service ☐ Container ☐ Object

### Allowed permissions ⓘ

☒ Read ☒ Write ☒ Delete ☒ List ☒ Add ☒ Create ☒ Update ☒ Process ☒ Immutable storage ☒ Permanent delete

### Blob versioning permissions ⓘ

☒ Enables deletion of versions

### Allowed blob index permissions ⓘ

☒ Read/Write ☒ Filter

### Start and expiry date/time ⓘ

|       |   |  |
|-------|---|--|
| Start | <input type="text" value="08/17/2022"/> | <input type="text" value="10:50:49 PM"/> |
| End   | <input type="text" value="08/18/2022"/> | <input type="text" value="6:50:49 AM"/>  |



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# Configure Security for Data

- Enable database authentication by using Azure AD
- Enable database auditing
- Configure dynamic masking on SQL workloads
- Implement database encryption for Azure SQL Database
- Implement network isolation for data solutions, including Azure Synapse Analytics and Azure Cosmos DB





## My role

- ✓ Read item
- ✓ Write item
- ✓ Execute query

**Role definition**



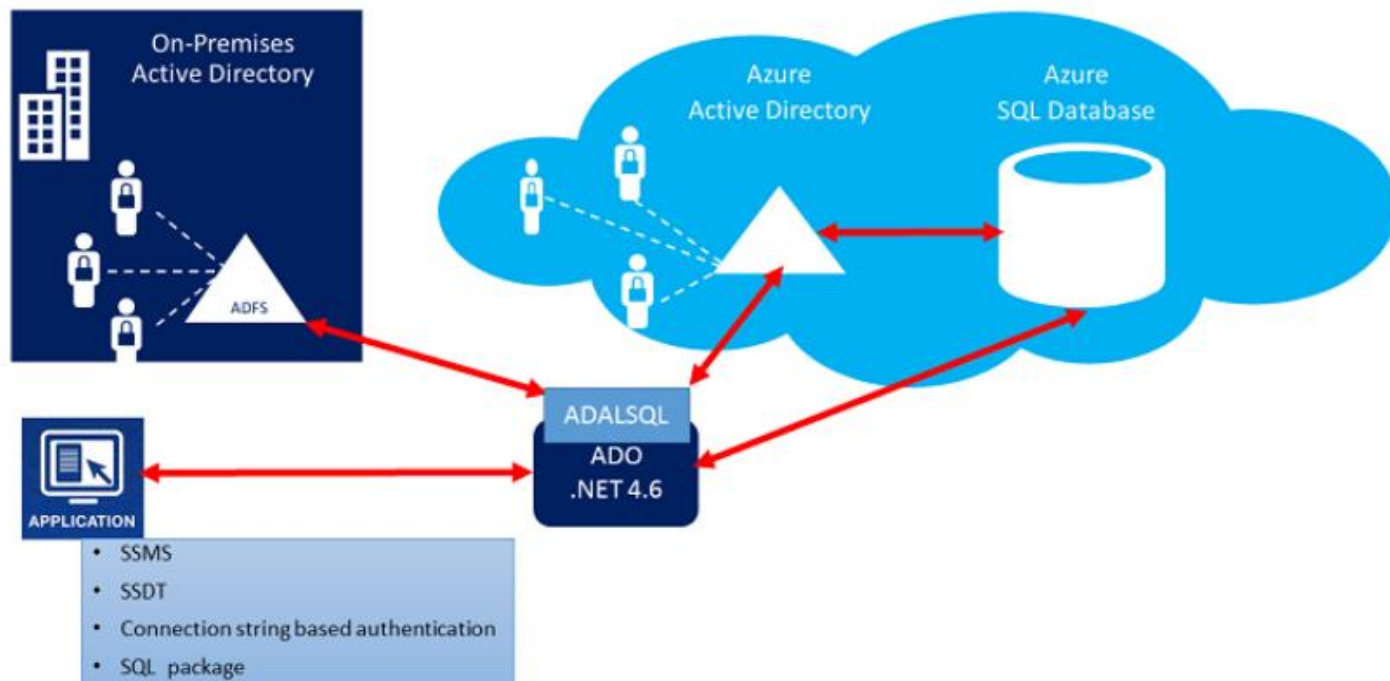
**Role assignment**



**User 123**




## Azure AD Authentication with SQL V12 DB





Home > mydocsamplesqlserver > MySampleDatabase (mydocsamplesqlserver/MySampleDatabase)

 **MySampleDatabase (mydocsamplesqlserver/MySampleDatabase)** | Auditing ...  
SQL database

Search (Ctrl+J)

« Save Discard View audit logs Feedback

Power Automate (preview)

Settings

Configure

Geo-Replication

Connection strings

Sync to other databases

Add Azure Search

Properties


Locks


Integrations


Stream analytics (preview)

Security


**Auditing**


 If Blob Auditing is enabled on the server, it will always apply to the database, regardless of the database settings.

**View server settings** 

 Server-level Auditing: **Enabled**

**Azure SQL Auditing**

Azure SQL Auditing tracks database events and writes them to an audit log in your Azure Storage account, Log Analytics workspace or Event Hub. [Learn more about Azure SQL Auditing](#) 

Enable Azure SQL Auditing  ☐



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# Configure and Manage Azure Key Vault

- Create and configure Key Vault
- Configure access to Key Vault
- Manage certificates, secrets, and keys
- Configure key rotation
- Configure backup and recovery of certificates, secrets, and keys



All services > Key vaults >

## Create a key vault

Basics Access policy Networking Tags Review + create

Azure Key Vault is a cloud service used to manage keys, secrets, and certificates. Key Vault eliminates the need for developers to store security information in their code. It allows you to centralize the storage of your application secrets which greatly reduces the chances that secrets may be leaked. Key Vault also allows you to securely store secrets and keys backed by Hardware Security Modules or HSMs. The HSMs used are Federal Information Processing Standards (FIPS) 140-2 Level 2 validated. In addition, key vault provides logs of all access and usage attempts of your secrets so you have a complete audit trail for compliance.

### Project details

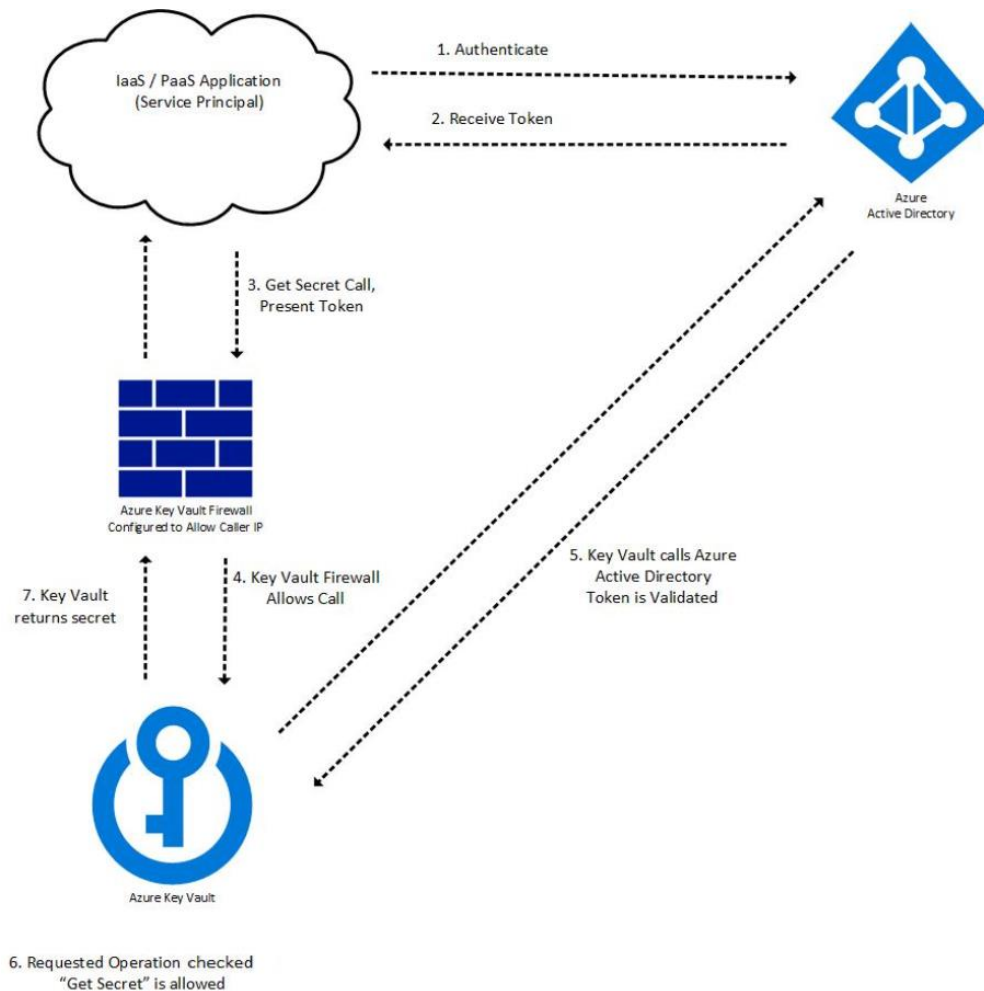
Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

|                  |  |
|------------------|--|
| Subscription *   | <input type="text" value="Pay-As-You-Go"/> |
| Resource group * | <input type="text"/>                       |
|                  | <a href="#">Create new</a>                 |

### Instance details

|                    |   |
|--------------------|---|
| Key vault name * ⓘ | <input type="text" value="Enter the name"/> |
| Region *           | <input type="text" value="East US"/>        |
| Pricing tier * ⓘ   | <input type="text" value="Standard"/>       |





## Rotation policy



testkey



Rotate now



Save



Discard changes



Refresh

Expiry time

2

years ▾

### Rotation

Enable auto rotation



Enabled



Disabled

Rotation option ⓘ

Automatically renew at a given time after c... ▾

Rotation time

18

months ▾

### Notification

Notification option ⓘ

Notify at a given time before expiry

Notification time

30

days ▾





[Home](#) > [Key vaults](#) > [new-primary-vault](#) | [Keys](#) >



[+ New Version](#) [↺ Refresh](#) [🗑 Delete](#) [⬇ Download Backup](#)

| Version         | Status    | Activation Date | Expiration Date |
|-----------------|-----------|-----------------|-----------------|
| CURRENT VERSION |           |                 |                 |
| f3c1            | ✓ Enabled |                 |                 |
| OLDER VERSIONS  |           |                 |                 |
| 0ee11           | ✓ Enabled | 5/5/2020        | 5/5/2022        |



# O'REILLY®

## Thank you!

Reza Salehi

@zaalion

