O'REILLY®

Azure Application Development

Creating Applications for the Microsoft Cloud

December/2022

Reza Salehi

Cloud Consultant

@zaalion

Questions & Resources

- Please port questions in the Q&A widget
- Course repository
  - https://github.com/zaalion/oreilly-application-dev-azure

- Reach out:
  - Twitter: @zaalion

Azure Application Development

- Azure Storage and Data platforms
- Azure Application platforms
- Application and Data Security
- Implement Communications
- Azure VMs and Containers
- Logging and Monitoring

AZ-204

- Exam AZ-204:
  https://docs.microsoft.com/en-us/learn/certifications/exams/az-204
- Skills measured :
  https://query.prod.cms.rt.microsoft.com/cms/api/am/binary/RE4oZ7B

Azure Storage and Data Services

- Azure Storage Accounts
- Azure Cosmos DB
- Azure SQL Database
- Azure Cache for Redis

Azure VMs and Containers (IaaS)

- Azure VMs
- Running containers in Azure (ACR, ACI, AKS, Azure Container Apps)

Azure Application Platforms

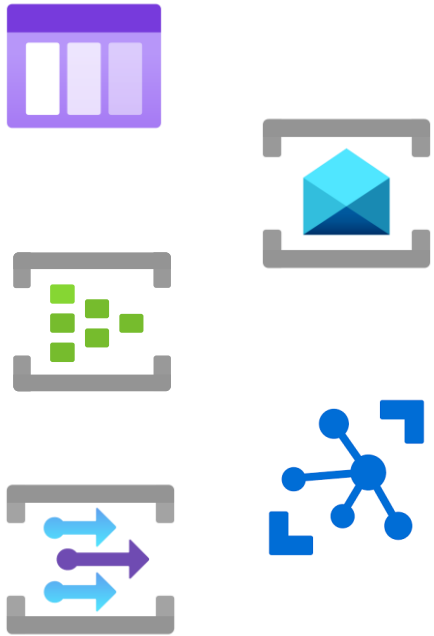
- Azure App Services
- Function Apps
- Logic Apps

Application and Data Security

- Azure Active Directory (AAD)
- RBAC and Managed Identity (MSI)
- Azure Key Vault

Implement Communications

- Azure Storage Queues
- Azure Service Bus Queues and Topics
- Azure Event Hubs
- Azure IoT Hub
- Azure Event Grid



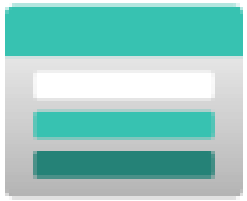
Logging and Monitoring

- Alerts and Metrics
- Application Insights
- Azure Log Analytics Workspace

Azure Storage and Data Services

Azure Storage Account

Contains all Azure Storage data objects, including blobs, file shares, queues, and tables.



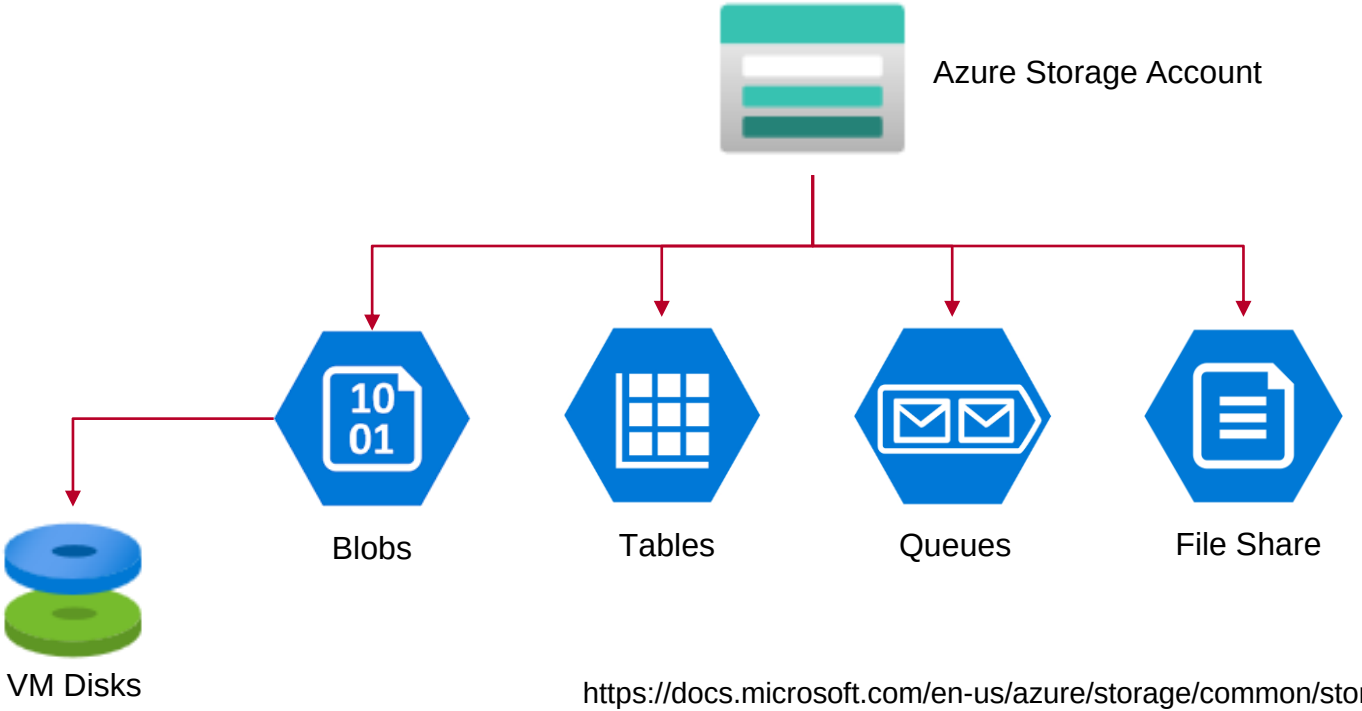
https://docs.microsoft.com/en-us/azure/storage/common/storage-account-overview

Azure Storage Account

- Accessible from around the globe over HTTP(S)
- Store blobs, tables, queues, and file shares
- Access via public and private endpoints
- Financially-backed SLA
- Security-in-depth (firewall, in transit, at rest)

https://docs.microsoft.com/en-us/azure/storage/common/storage-account-overview

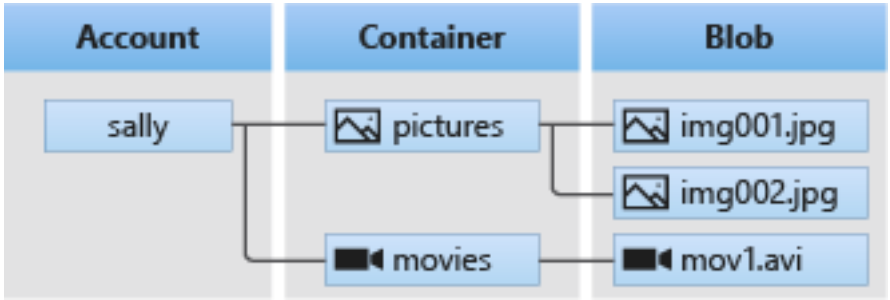
Azure Storage Services



https://docs.microsoft.com/en-us/azure/storage/common/storage-introduction

Azure Storage Account: Blobs

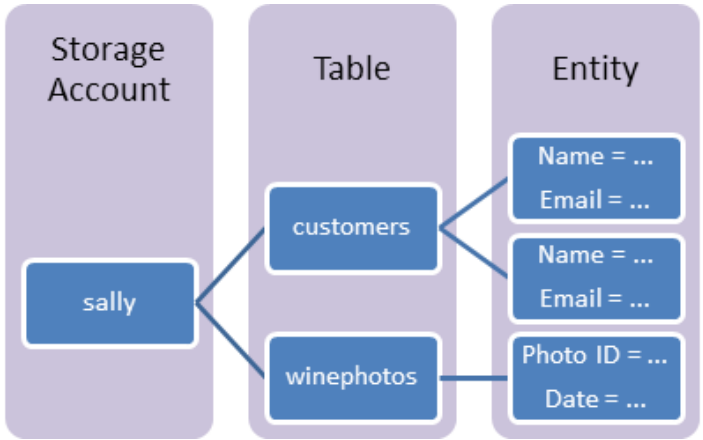
A scalable object store for text/binary files (unstructured data). Also includes support for big data analytics through Data Lake Storage Gen2



https://docs.microsoft.com/en-us/azure/storage/blobs/storage-blobs-introduction

Azure Storage Account: Tables

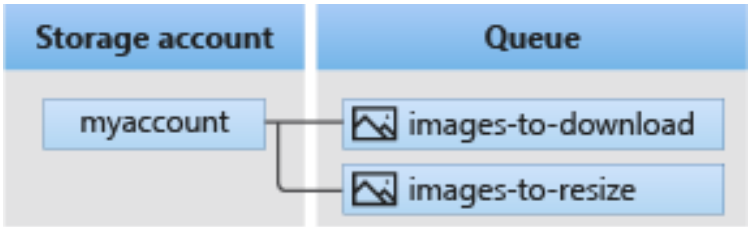
Stores non-relational structured data (structured NoSQL) in the cloud, providing a key/attribute store with a schema-less design



https://docs.microsoft.com/en-us/azure/storage/tables/table-storage-overview

Azure Storage Account: Queues

- Stores a large number of messages in a queue data structure
- A queue message can be up to 64 KB in size (use Service Bus for bigger messages)
- Create a backlog of work to process asynchronously



https://docs.microsoft.com/en-us/azure/storage/queues/storage-queues-introduction

Azure Storage Account: Files

- File shares in the cloud that are accessible via the industry standard Server Message Block (SMB) protocol, Network File System (NFS) protocol, and Azure Files REST API

https://docs.microsoft.com/en-us/azure/storage/files/storage-files-introduction

Storage Account Redundancy Option

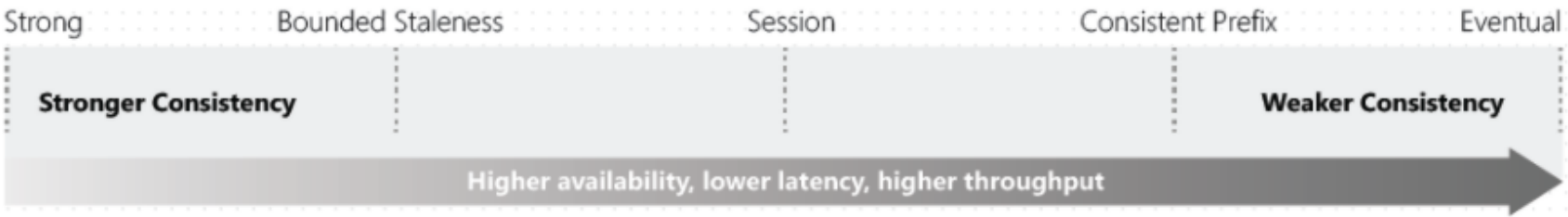
- Locally redundant storage
- Zone-redundant storage
- Geo-redundant storage
- Geo-zone-redundant storage

https://docs.microsoft.com/en-us/azure/storage/common/storage-redundancy

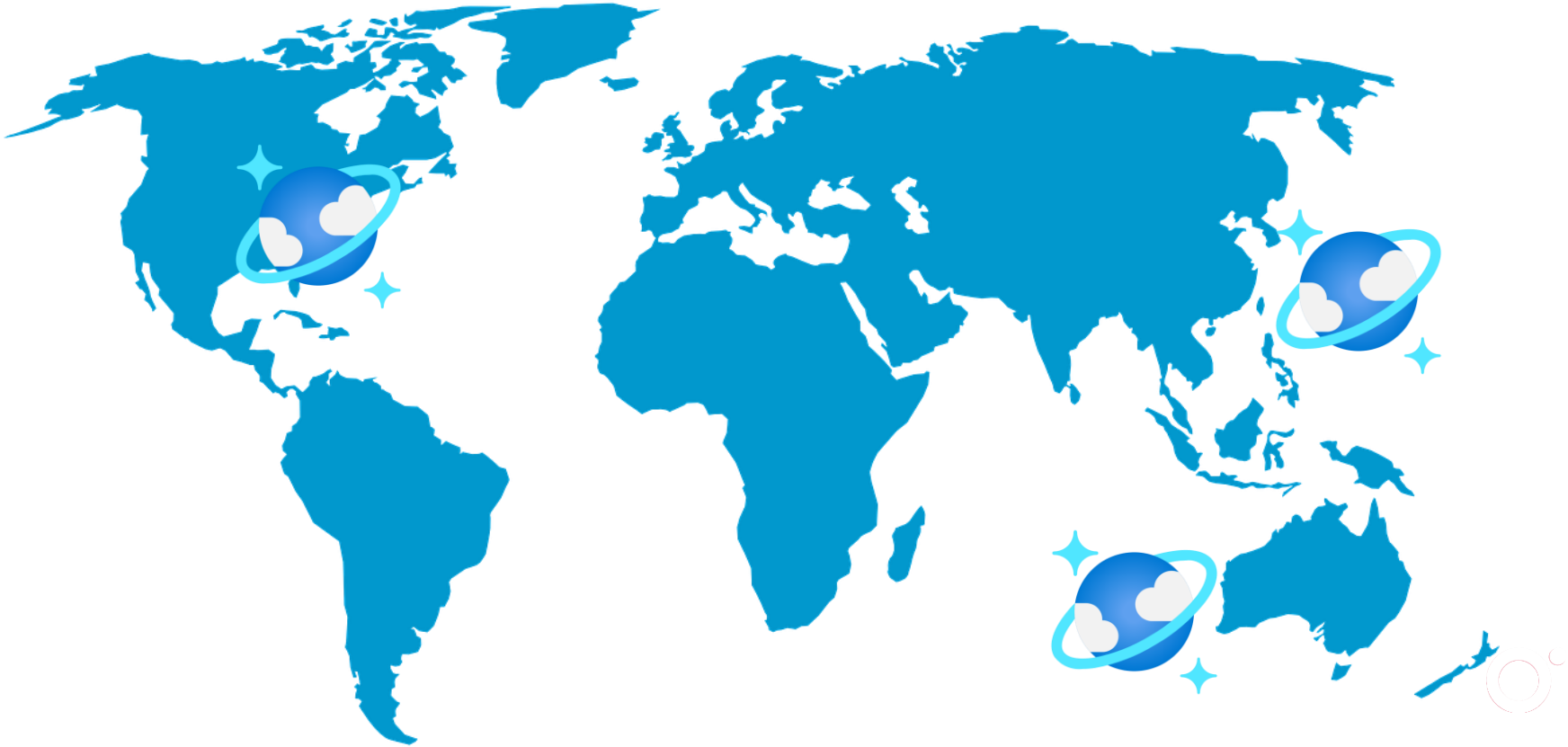
Azure Cosmos DB

- A fully-managed NoSQL database for modern app development
- Azure Cosmos DB for NoSQL
- Azure Cosmos DB for MongoDB
- Azure Cosmos DB for Apache Cassandra
- Azure Cosmos DB for Apache Gremlin
- Azure Cosmos DB for Table
- Azure Cosmos DB for PostgreSQL

Azure Cosmos DB Consistency



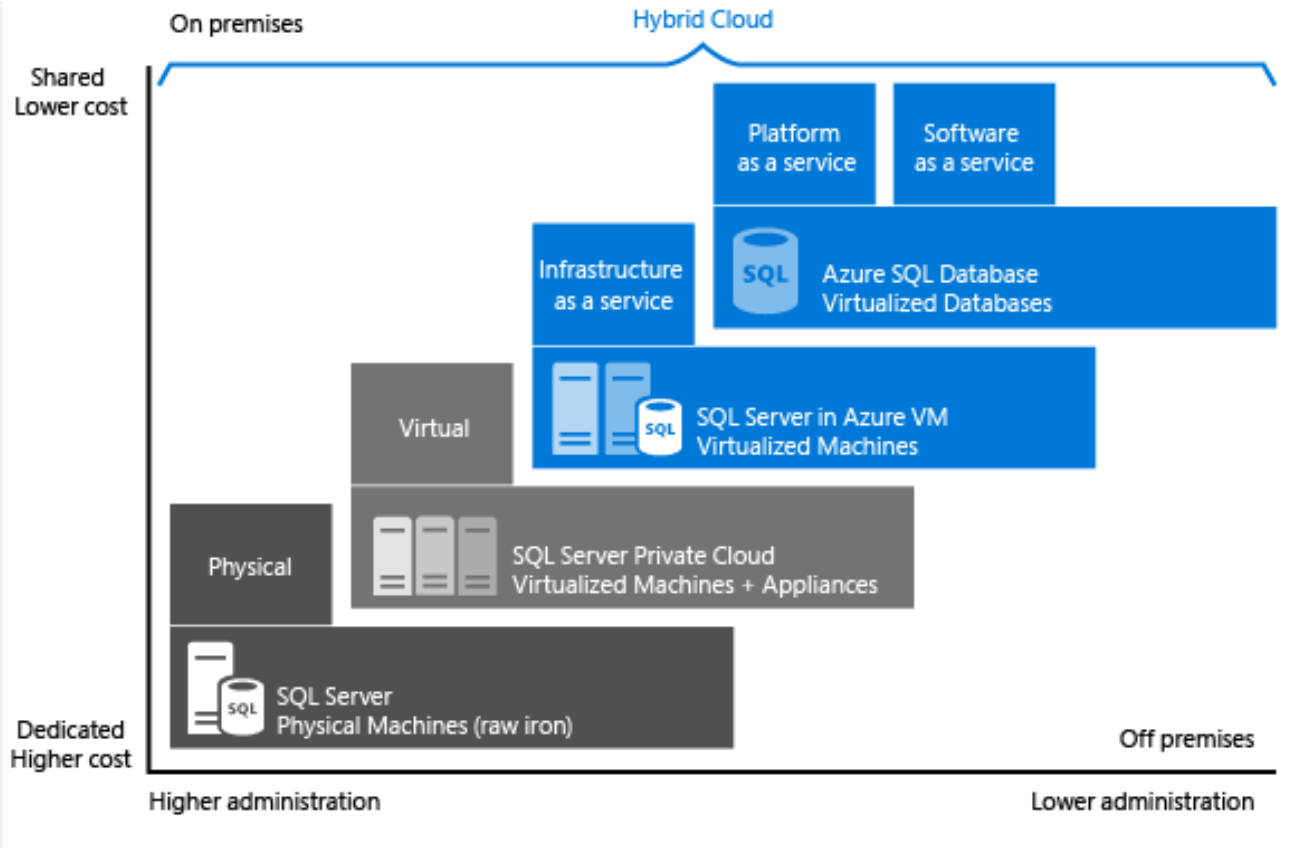
Azure Cosmos DB Multi-region Writes



Azure SQL

- Azure SQL is a family of managed, secure, and intelligent products that use the SQL Server database engine in the Azure cloud

Azure SQL

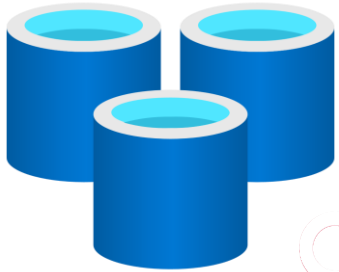

On premises
Hybrid Cloud
Shared
Lower cost
Platform
as a service
Software
as a service
Infrastructure
as a service
SQL
Azure SQL Database
Virtualized Databases
Virtual
SQL
SQL Server in Azure VM
Virtualized Machines
Physical
SQL Server Private Cloud
Virtualized Machines + Appliances
SQL
SQL Server
Physical Machines (raw iron)
Dedicated
Higher cost
Off premises
Higher administration
Lower administration

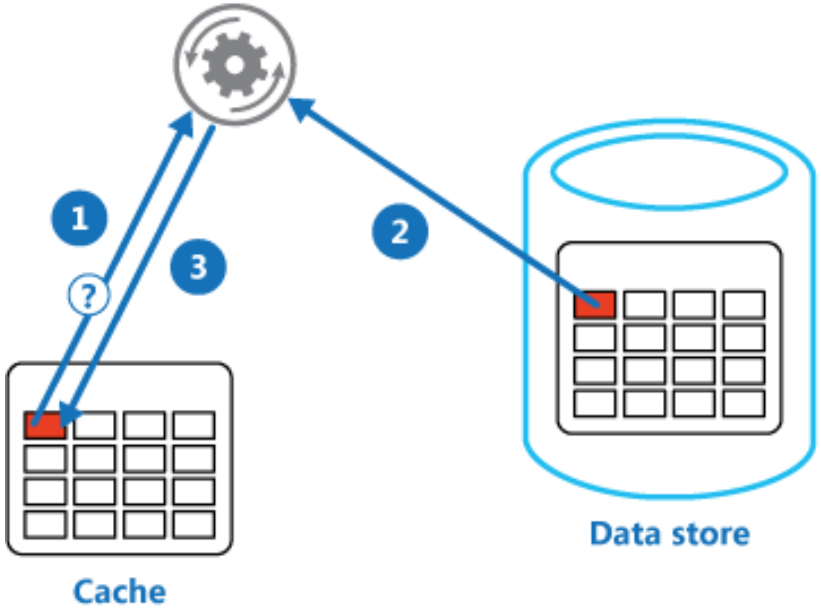
Azure SQL (Database)

- Azure SQL Database offers the following deployment options:
- Single database
- Elastic pool

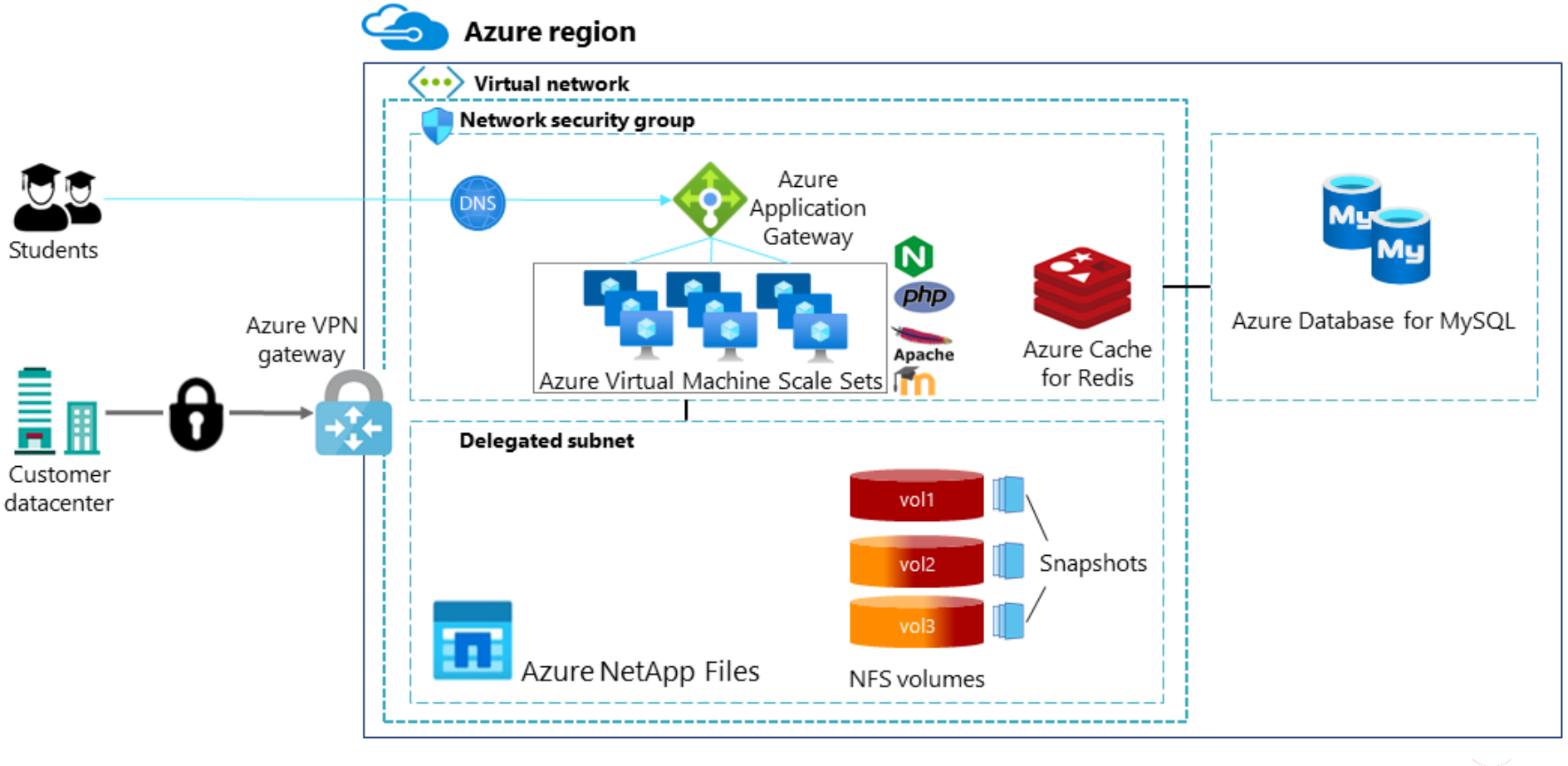
Azure Cache for Redis

- Azure Cache for Redis provides an in-memory data store based on the Redis cache engine.
- Basic
- Standard
- Premium
- Enterprise
- Enterprise Flash





1: Determine whether the item is currently held in the cache.
2: If the item is not currently in the cache, read the item from the data store.
3: Store a copy of the item in the cache.


Azure region
Virtual network
Network security group
Students
DNS
Azure Application Gateway
Azure VPN gateway
Azure Virtual Machine Scale Sets
Apache
Azure Cache for Redis
Azure Database for MySQL
Customer datacenter
Delegated subnet
vol1
vol2
vol3
Snapshots
Azure NetApp Files
NFS volumes

Hosting Azure Applications

App Services

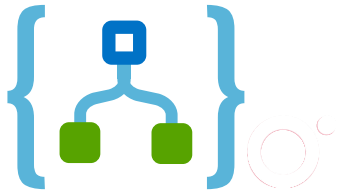
- Azure App Service is an HTTP-based service for hosting web applications, REST APIs, and mobile back ends
- Windows and Linux
- Shared , dedicated and isolated compute

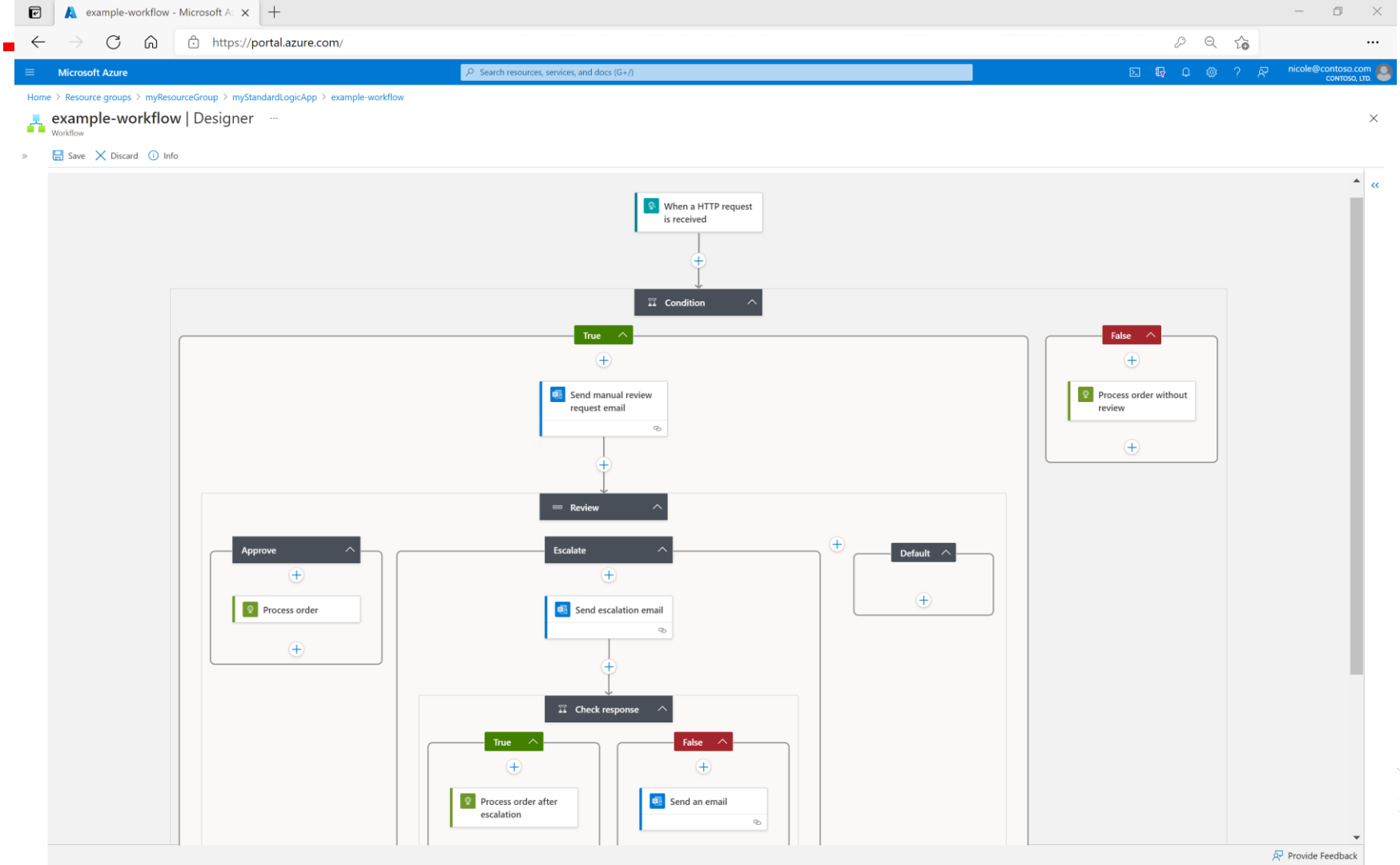
Azure Functions

- Azure Functions is a serverless solution that allows you to host your applications in Azure
- Triggers, Input & output bindings
- Durable Functions is an extension of Azure Functions that lets you write stateful functions in a serverless compute environment.

Azure Logic Apps

- A cloud service that helps you schedule, automate, and orchestrate tasks, business processes, and workflows when you need to integrate apps, data, systems, and services across enterprises or organizations.
- Has a visual designer, also use ARM-like syntax to develop




example-workflow - Microsoft A
https://portal.azure.com/
Microsoft Azure
Search resources, services, and docs (G+/)
nicole@contoso.com
CONTOSO, LTD.
Home > Resource groups > myResourceGroup > myStandardLogicApp > example-workflow
example-workflow | Designer
Workflow
Save
Discard
Info
When a HTTP request is received
Condition
True
False
Send manual review request email
Process order without review
Review
Approve
Escalate
Default
Process order
Send escalation email
Check response
True
False
Process order after escalation
Send an email
Provide Feedback

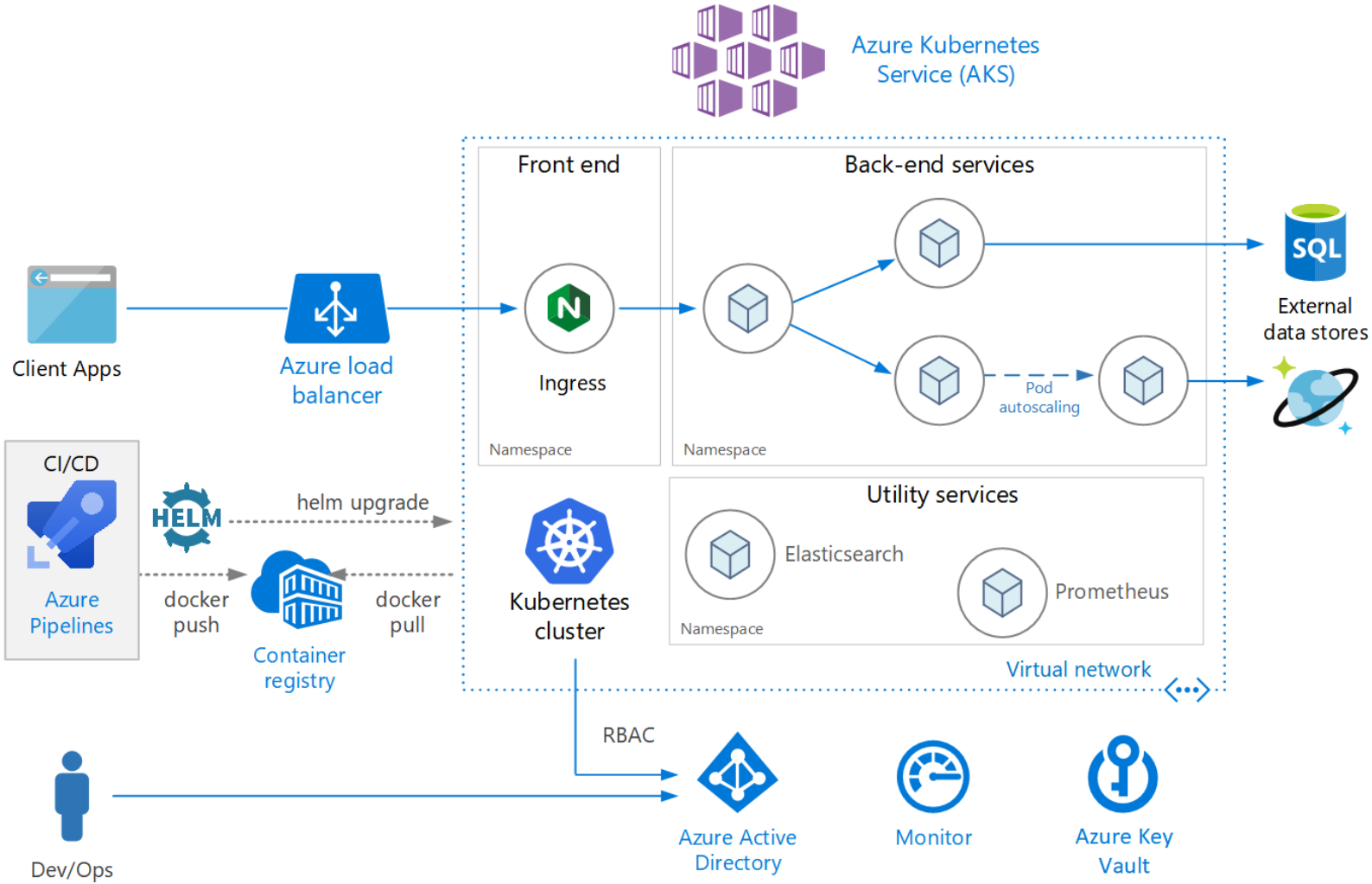
Application and Data Security

Azure Active Directory

- Azure Active Directory (Azure AD) is Microsoft's cloud-based identity and access management service.

Azure Active Directory

- Azure Active Directory (Azure AD) is Microsoft's cloud-based identity and access management service.
- Define identities for humans and processes
- Grant access over resources/application to the above identities using RBAC/Access Policies

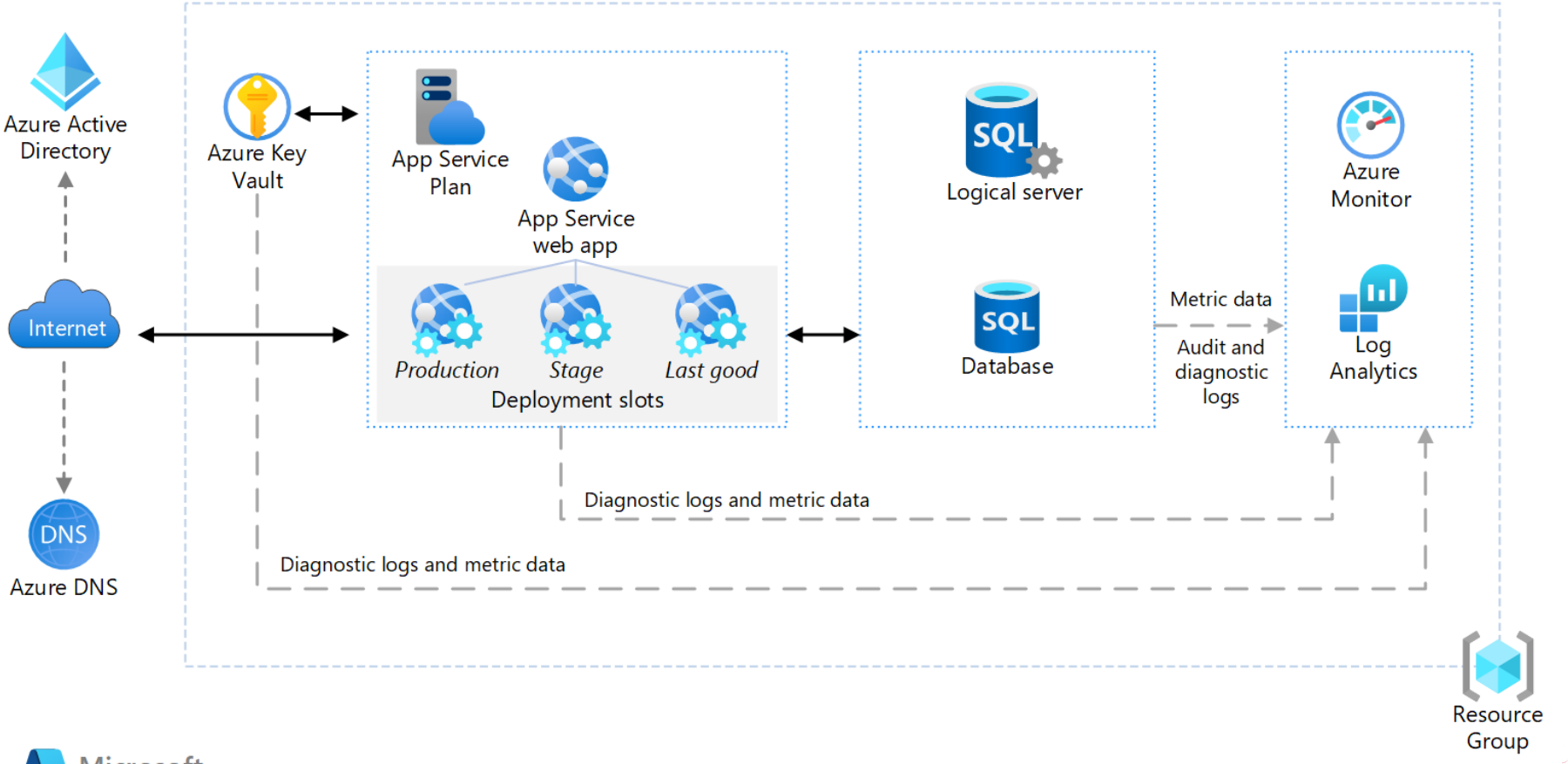

Azure Kubernetes Service (AKS)
Front end
Back-end services
Client Apps
Azure load balancer
Ingress
Namespace
Namespace
Pod autoscaling
SQL
External data stores
CI/CD
Azure Pipelines
HELM
helm upgrade
docker push
docker pull
Container registry
Kubernetes cluster
Utility services
Elasticsearch
Prometheus
Namespace
Virtual network
RBAC
Dev/Ops
Azure Active Directory
Monitor
Azure Key Vault

Managed Identity

- Is an Azure Active Directory (Azure AD) service
- Eliminates the need to manage credentials. (App id, secrets, tenant ids, etc.)
- Provide an identity for applications and services to use when connecting to resources that support Azure Active Directory (Azure AD) authentication

Azure Key Vault

- Helps securely store secrets, keys and certificates in Azure
- Secrets Management (tokens, passwords, API keys, etc.)
- Key Management (encryption keys used to encrypt your data)
- Certificate Management (private TLS/SSL certificates)


Azure Active Directory
Azure Key Vault
App Service Plan
App Service web app
Logical server
Azure Monitor
Internet
Production
Stage
Last good
Deployment slots
Database
Metric data
Audit and diagnostic logs
Log Analytics
DNS
Azure DNS
Diagnostic logs and metric data
Diagnostic logs and metric data
Resource Group
Microsoft Azure

Implement Communications

Azure Storage Queues

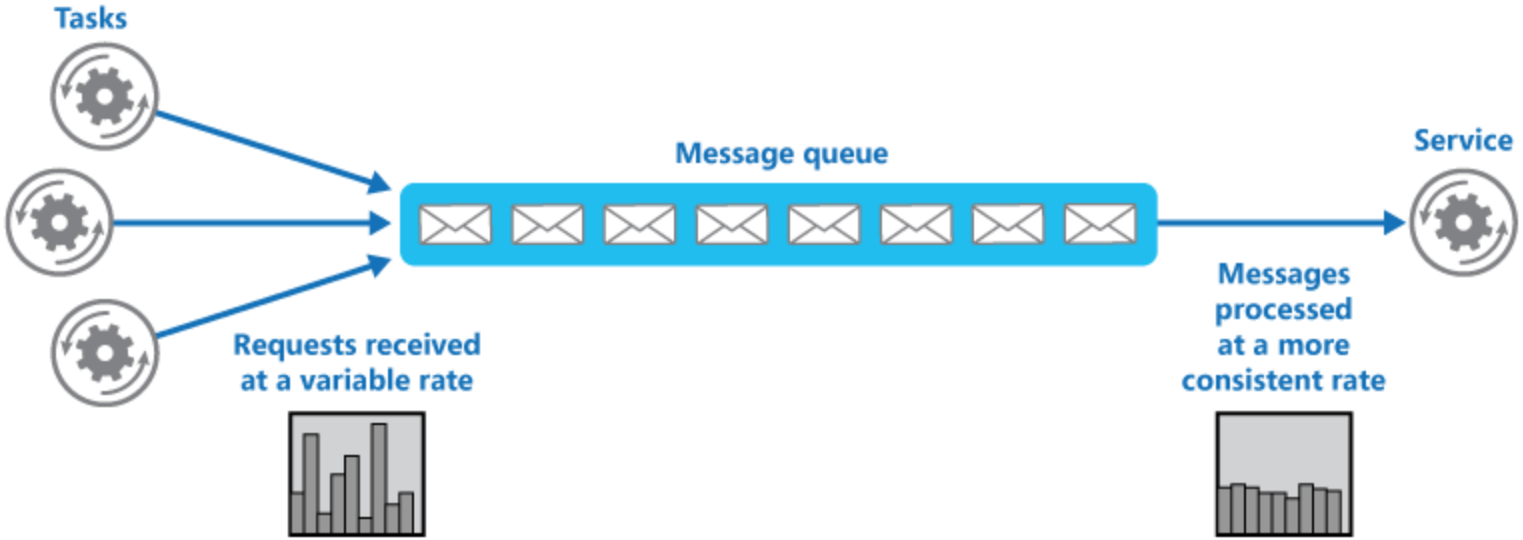
- A service for storing large numbers of messages
- A queue message can be up to 64 KB in size
- FIFO is intended but not guaranteed
- More affordable comparing to Azure Service Bus queues.

Azure Storage Queues

- A service for storing large numbers of messages
- A queue message can be up to 64 KB in size
- FIFO is intended but not guaranteed
- More affordable comparing to Azure Service Bus queues.

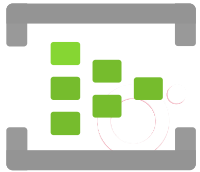
Service Bus Queues and Topics

- Azure Service Bus supports a set of cloud-based, message-oriented middleware technologies including reliable message queuing and durable publish/subscribe messaging.
- Queues (single receiver)
- Topics (multiple subscribers)

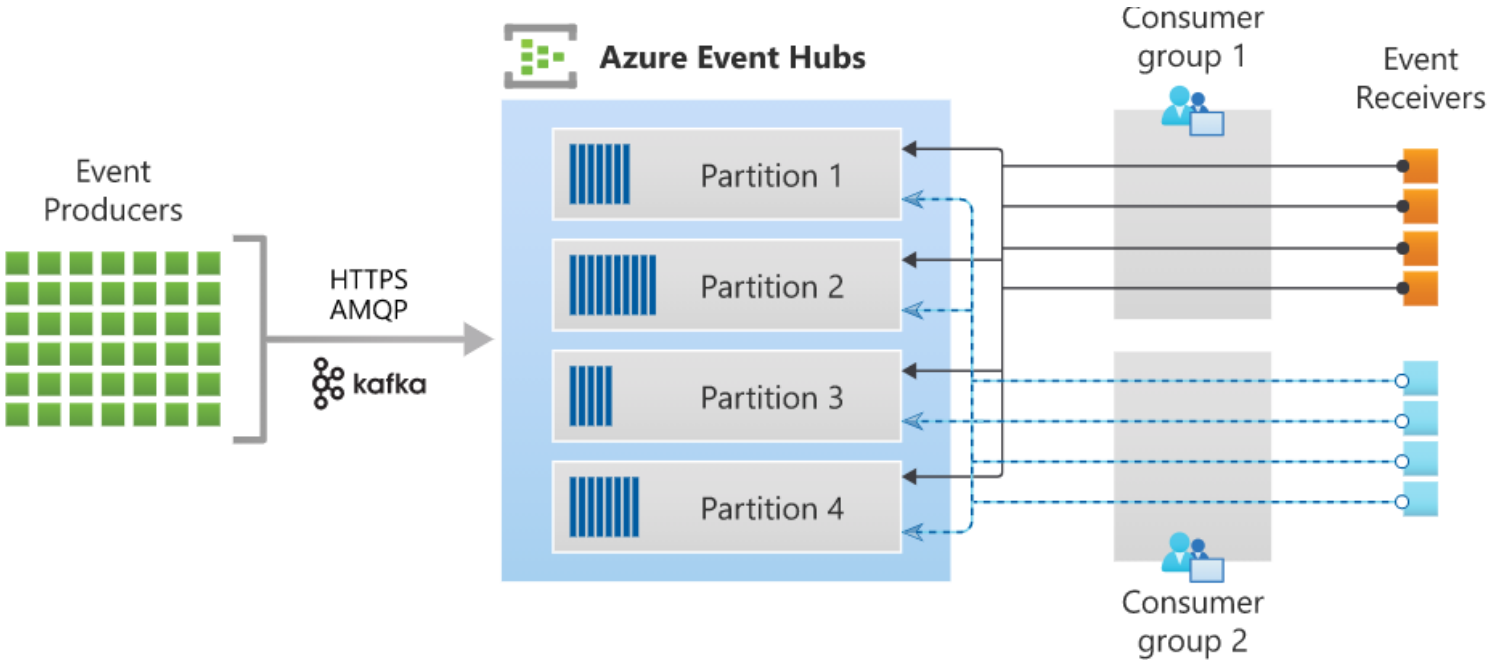

Tasks
Message queue
Service
Requests received
at a variable rate
Messages
processed
at a more
consistent rate

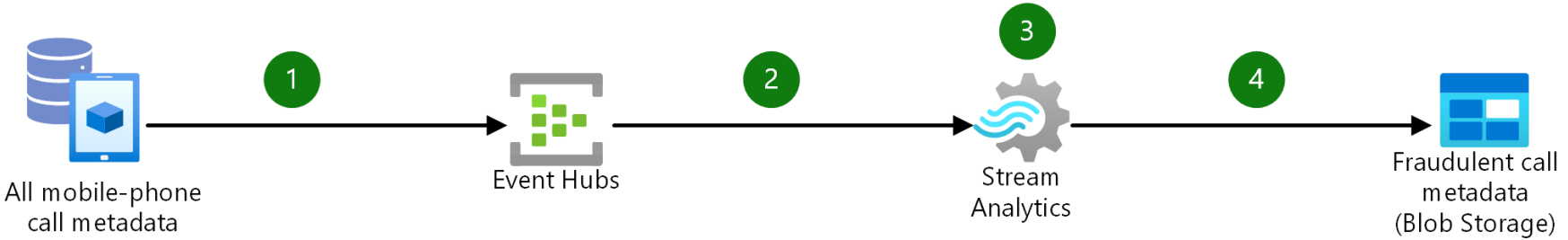
Azure Event Hubs

- Azure Event Hubs is a big data streaming platform and event ingestion service.
- Anomaly detection (fraud/outliers)
- Application logging
- Transaction processing
- User telemetry processing
- Device telemetry streaming



Azure Event Hubs

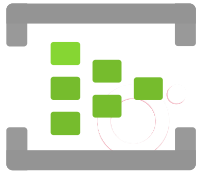


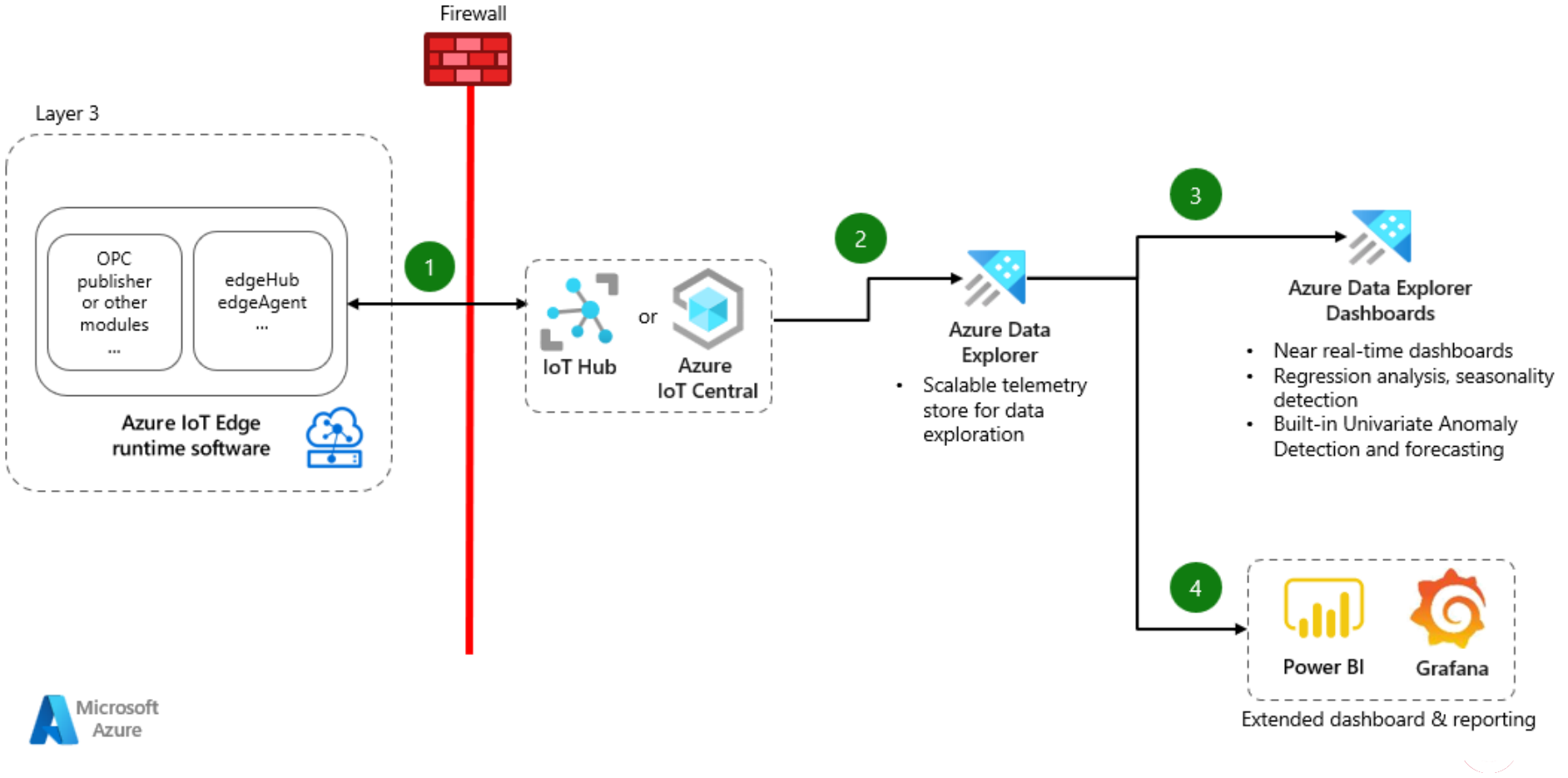


Microsoft Azure

Azure IoT Hub

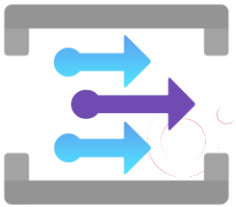
- A managed service that acts as a central message hub for communication between an IoT application and its attached devices.
- Device-to-cloud (d2c) messaging
- Cloud-to-device (c2d) messaging
- Ingesting millions of messages per minute



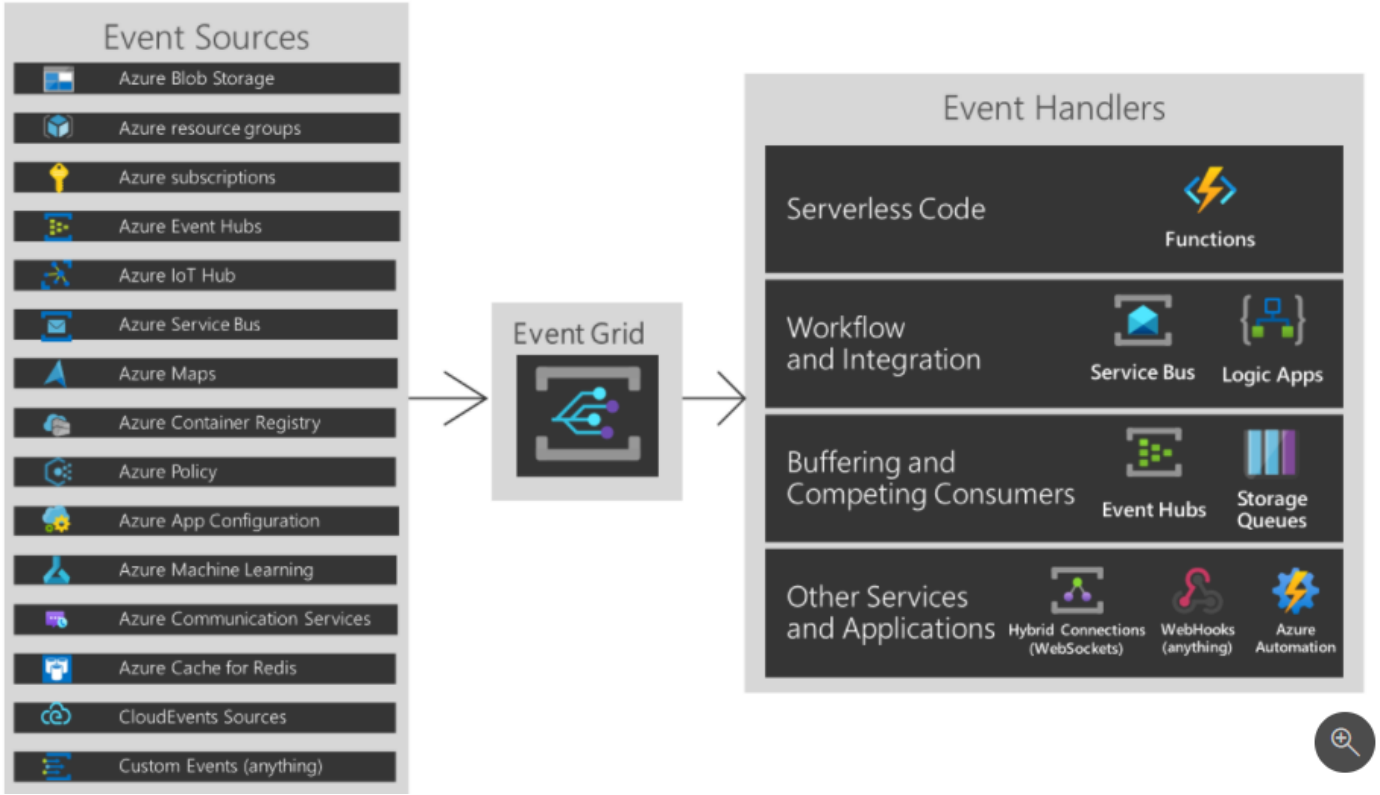

Firewall
Layer 3
OPC publisher or other modules ...
edgeHub edgeAgent ...
Azure IoT Edge runtime software
1
IoT Hub
or
Azure IoT Central
2
Azure Data Explorer
Scalable telemetry store for data exploration
3
Azure Data Explorer Dashboards
Near real-time dashboards
Regression analysis, seasonality detection
Built-in Univariate Anomaly Detection and forecasting
4
Power BI
Grafana
Extended dashboard & reporting
Microsoft Azure

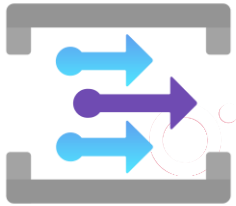
Azure Event Grid

- Azure Event Grid allows you to easily build applications with event-based architectures.
- Event sources (Azure App Configuration, Azure Blob Storage, Azure Communication Services, …)
- Event handlers (Azure Functions, Event Hubs, etc.)



Azure Event Grid





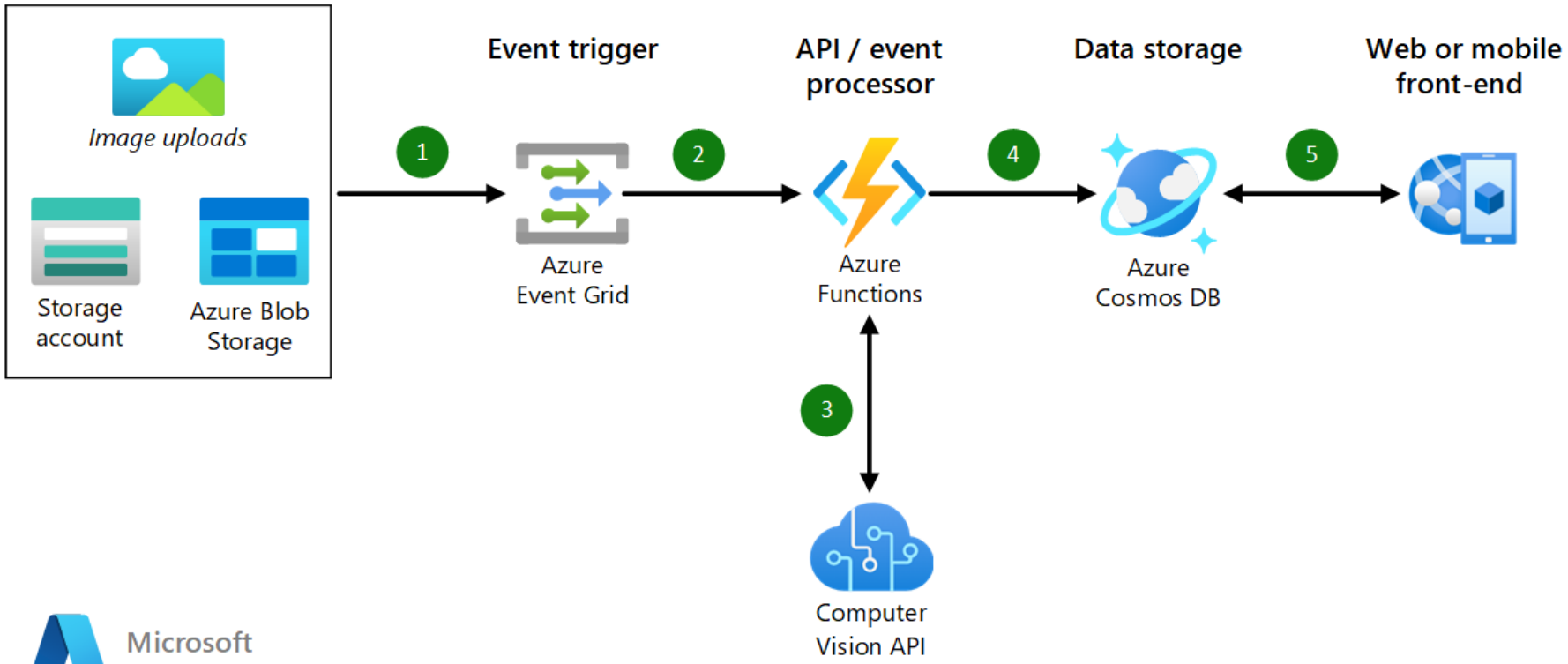
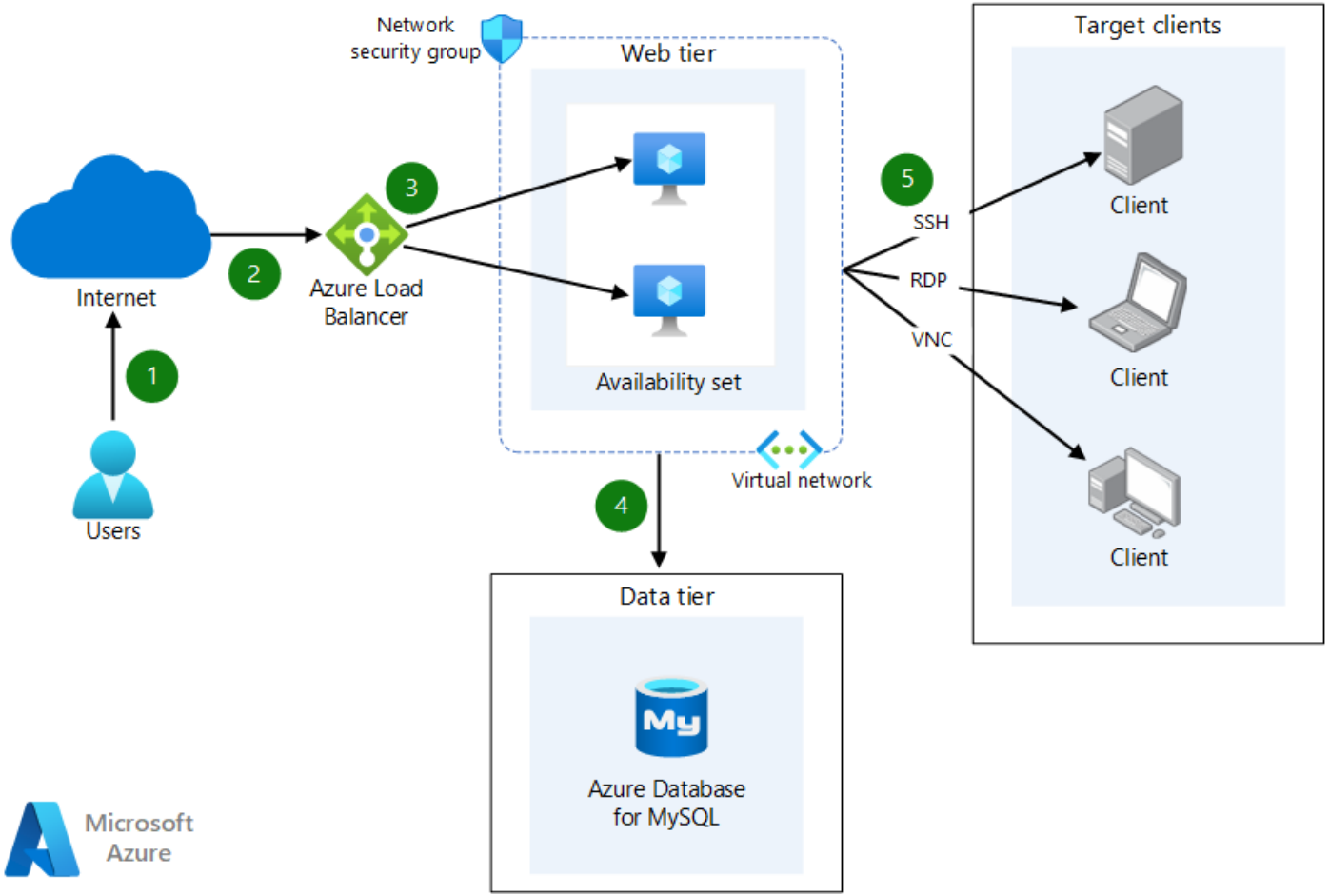


Image uploads
Storage account
Azure Blob Storage
Event trigger
API / event processor
Data storage
Web or mobile front-end
1
2
3
4
5
Azure Event Grid
Azure Functions
Azure Cosmos DB
Computer Vision API
Microsoft Azure

Azure VMs and Containers

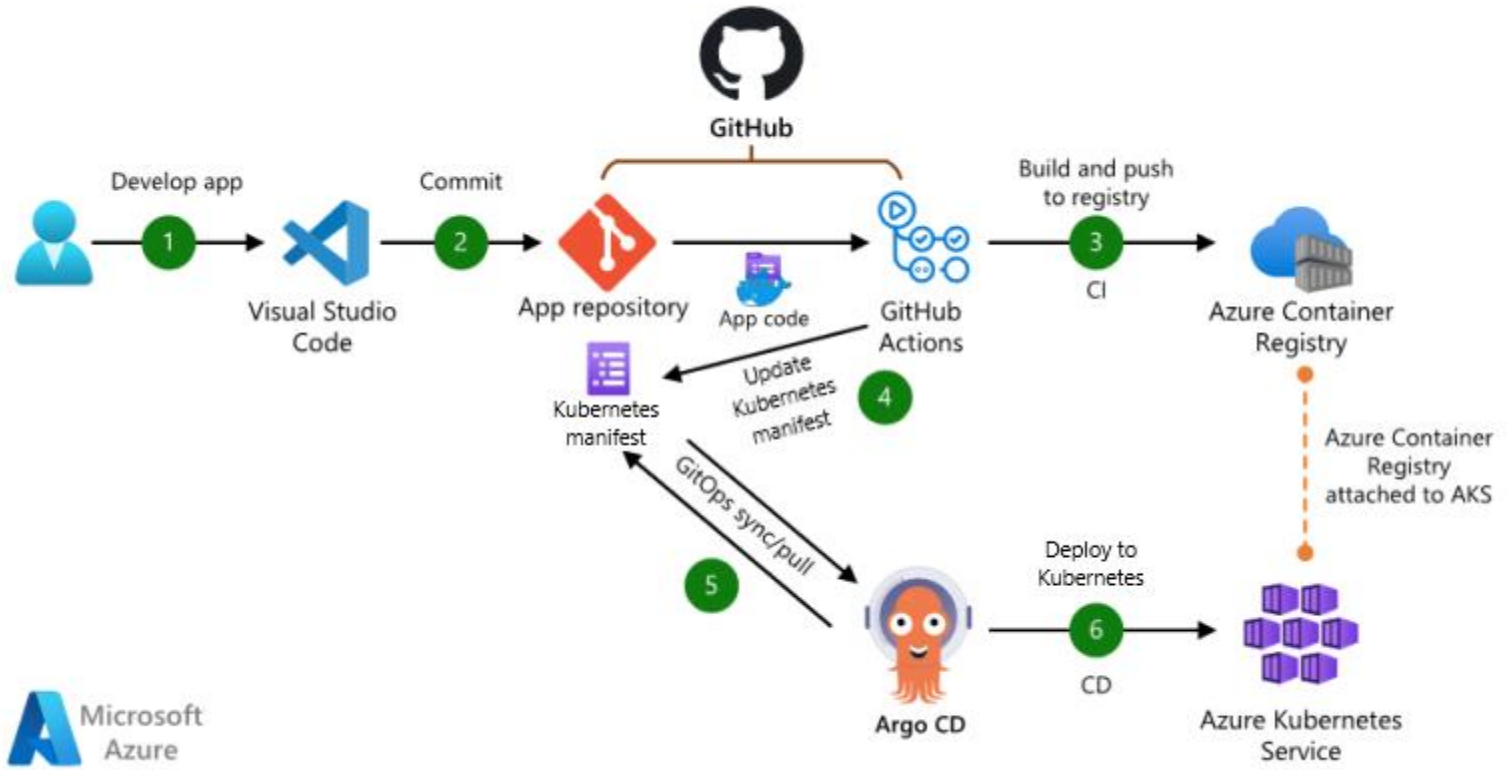
Azure VMs

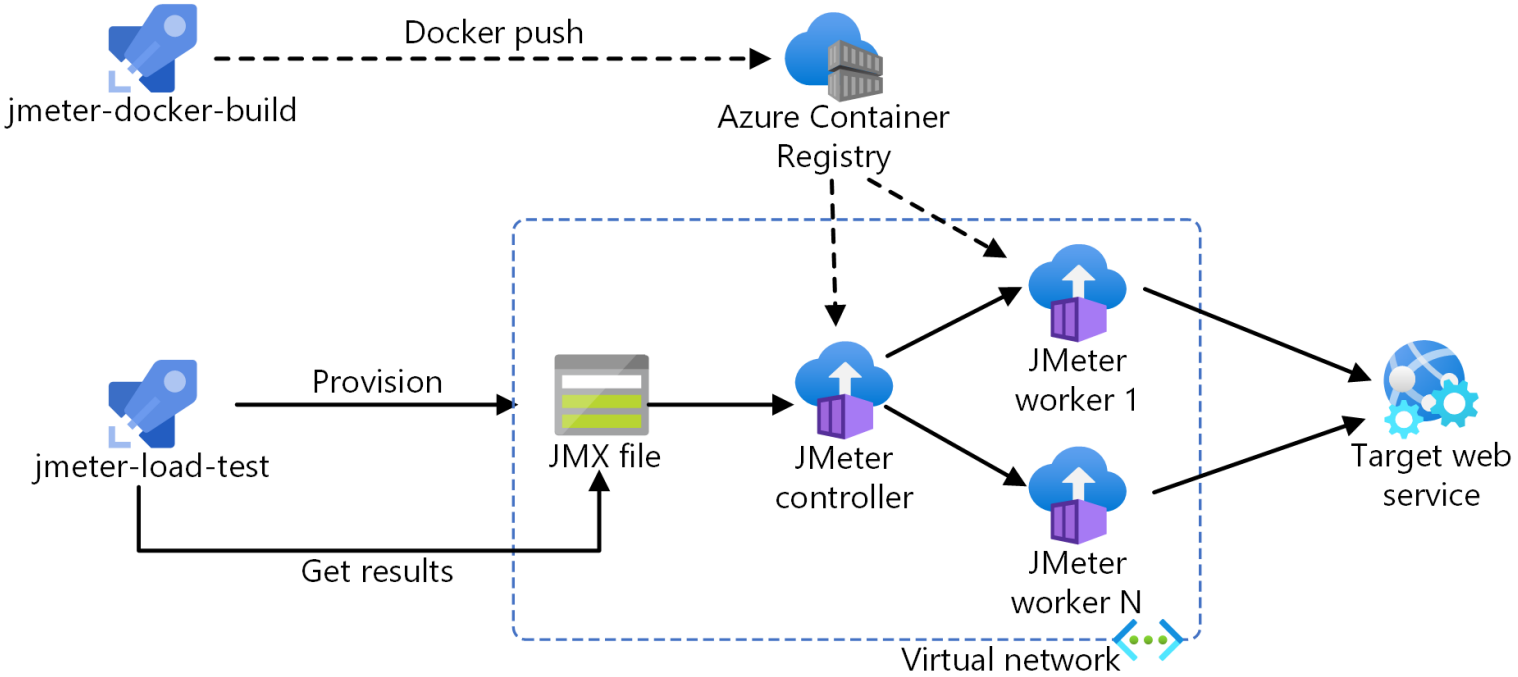
- An Azure VM gives you the flexibility of virtualization without having to buy and maintain the physical hardware that runs it.
- Host VMs in Azure


Network security group
Web tier
Target clients
Internet
Azure Load Balancer
Availability set
Client
Client
Client
SSH
RDP
VNC
Users
Virtual network
Data tier
Azure Database for MySQL
Microsoft Azure

Hosting Containers in Azure

- Azure Container Registry (ACR) : build, store, and manage container images and artifacts in a private registry
- Azure Container Instances (ACI): host isolated containers
- Azure Kubernetes Service (AKS): simplifies deploying a managed Kubernetes cluster in Azure
- Azure Container Apps (ACA): Run microservices and containerized applications on a serverless platform.


GitHub
Develop app
1
Visual Studio Code
Commit
2
App repository
App code
GitHub Actions
Build and push to registry
3
CI
Azure Container Registry
Azure Container Registry attached to AKS
Update Kubernetes manifest
4
Kubernetes manifest
GitOps sync/pull
5
Argo CD
Deploy to Kubernetes
6
CD
Azure Kubernetes Service
Microsoft Azure



Microsoft Azure

Logging and Monitoring

Azure Monitor

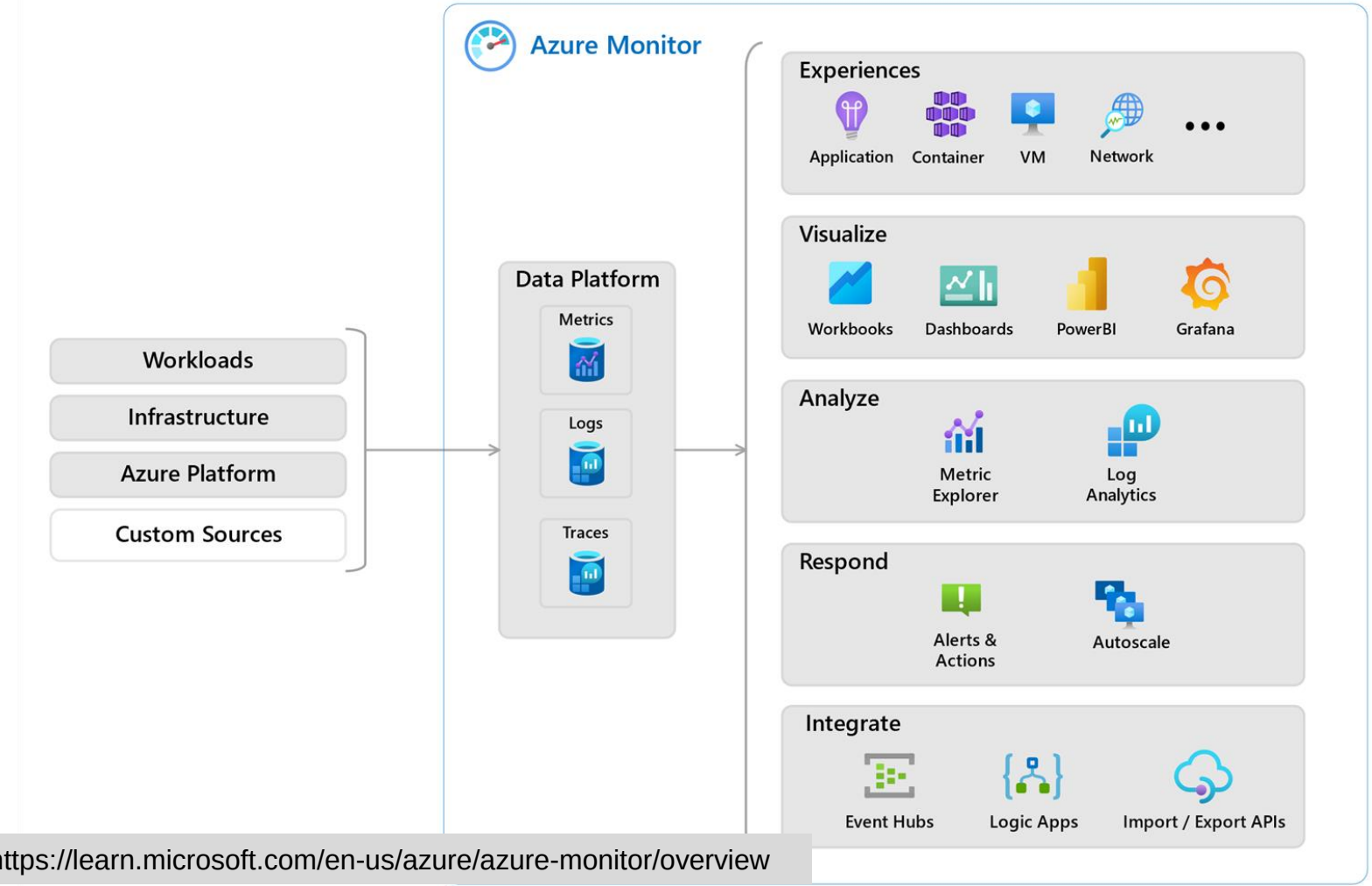
Helps you collect, analyze, and act on telemetry from your cloud and on-premises environments.

https://docs.microsoft.com/en-us/azure/azure-monitor/overview

Azure Monitor

- Detect and diagnose issues across applications and their dependencies using **Application Insights**.
- Detect and correlate infrastructure issues with **VM insights** and **Container insights**.
- Drill into your monitoring data with **Log Analytics**
- Collect resource performance data using **Azure Monitor Metrics**.

https://docs.microsoft.com/en-us/azure/azure-monitor/overview



https://learn.microsoft.com/en-us/azure/azure-monitor/overview

Azure Monitor Alerts and Actions

- Alerts notify you of possible problems with your resources or infrastructure.

- Actions help you address the issues

https://docs.microsoft.com/en-us/azure/azure-monitor/alerts/alerts-overview

Azure Monitor Alert Types

- Metric alerts
- Log alerts
- Activity log alerts
- Smart detection alerts (Web application - Application Insights)

https://docs.microsoft.com/en-us/azure/azure-monitor/alerts/alerts-overview#types-of-alerts

Azure Monitor Application Insights

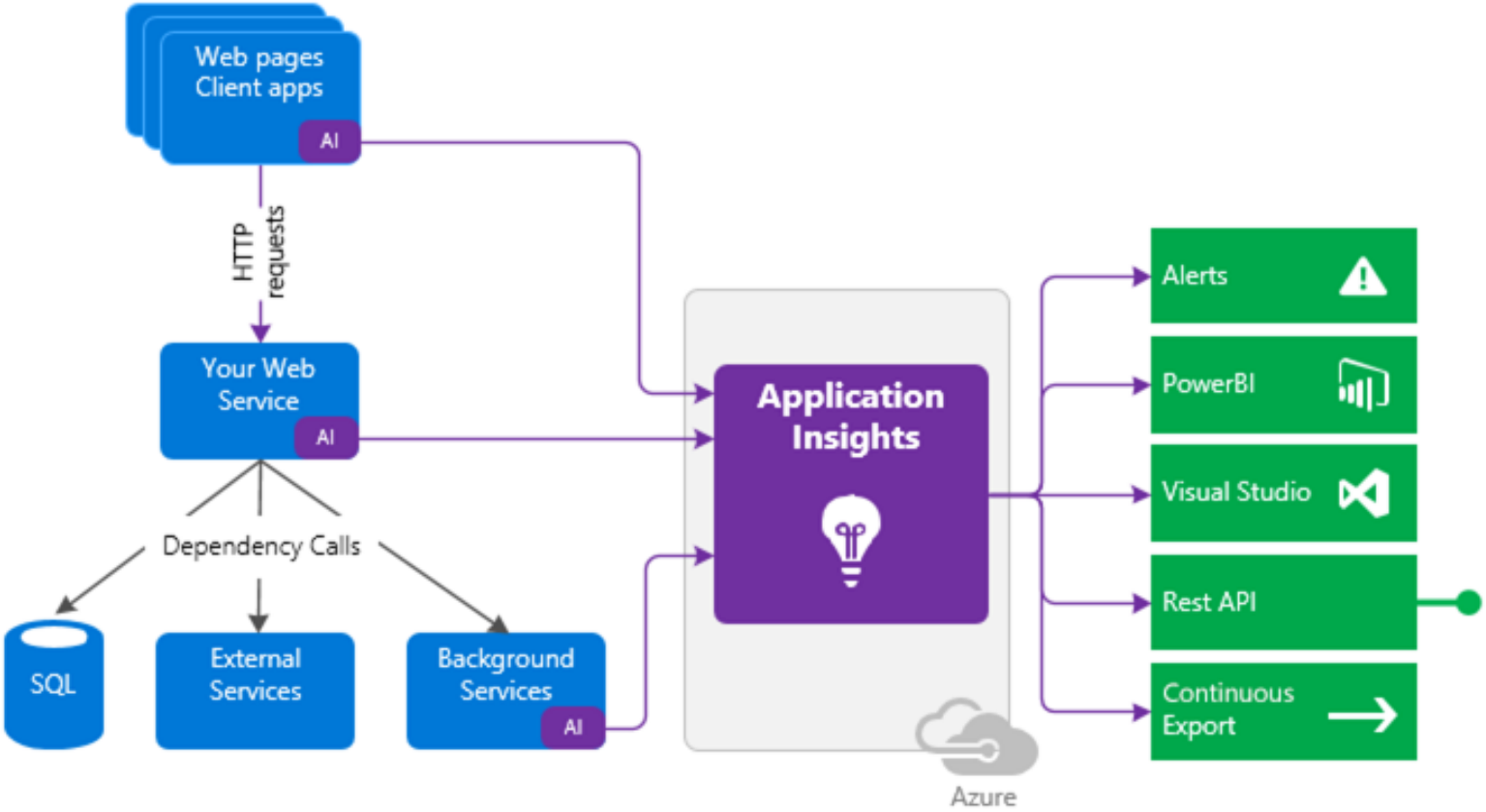
Application Insights is a feature of Azure Monitor that provides extensible application performance management and monitoring for **live web apps**

https://docs.microsoft.com/en-us/azure/azure-monitor/app/app-insights-overview

Azure Monitor Application Insights

- Automatically detect performance anomalies
- Help diagnose issues by using analytics tools
- See what users do with apps
- Help to improve app performance and usability
- Supports many platforms, including .NET, Node.js, Java, and Python

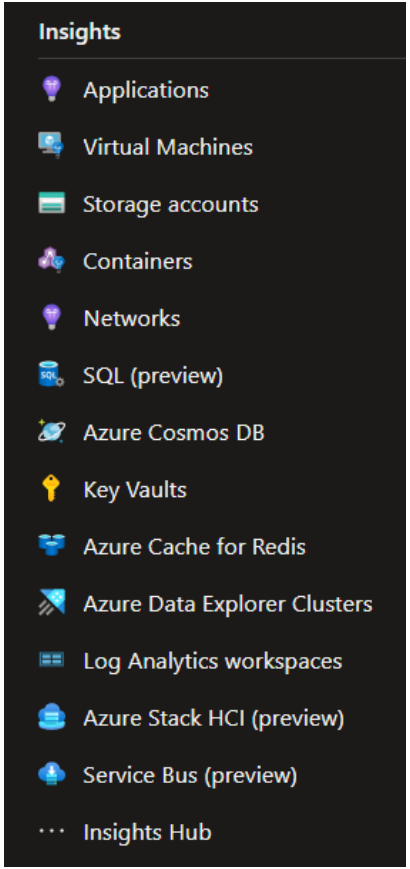
https://docs.microsoft.com/en-us/azure/azure-monitor/app/app-insights-overview



https://docs.microsoft.com/en-us/azure/azure-monitor/app/app-insights-overview

Insights

- Azure Monitor Application Insights
- Azure Data Explorer insights
- Azure Container Insights
- Azure Cosmos DB Insights
- Azure Service Bus Insights
- Azure Storage Insights
- Azure Network Insights
- Azure VM Insights
- Azure Virtual Desktop Insights
- …



https://docs.microsoft.com/en-us/azure/azure-monitor/monitor-reference#insights-and-curated-visualizations

Azure Log Analytics

- Log Analytics is a tool in the Azure portal used to edit and run log queries with data in Azure Monitor Logs.

The Exam

AZ-204

- Exam AZ-204:
  https://docs.microsoft.com/en-us/learn/certifications/exams/az-204
- Skills measured :
  https://query.prod.cms.rt.microsoft.com/cms/api/am/binary/RE4oZ7B

Questions in AZ-204

- Multiple choice
- Drag and drop
- Scenario based
- There will be hands-on labs

Questions in AZ-204

Tip

- Watch **AZ-204 Exam Prep videos** on Learn
- Download the **AZ-204 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 Developer Associate
Related exams: none
Important: See details
Go to Certification Dashboard

Schedule exam

Exam AZ-204: Developing Solutions for Microsoft Azure

United States

Languages: English, Japanese, Chinese (Simplified), Korean, French, German, Spanish, Portuguese (Brazil), Russian, Chinese (Traditional), Italian, Indonesian (Indonesia), Arabic (Saudi Arabia)
Retirement date: none

This exam measures your ability to accomplish the following technical tasks: develop Azure compute solutions; develop for Azure storage; implement Azure security; monitor, troubleshoot, and optimize Azure solutions; and connect to and consume Azure services and third-party services. You will be able to select the code language (C# or Python) that's included in the questions when you launch the exam.

$165 USD*

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

Schedule exam >

Official practice test for Developing Solutions for Microsoft Azure
All objectives of the exam are covered in depth so you'll be ready for any question on the exam.

⊕ Save

Select exam options

AZ-104: Microsoft Azure Administrator

Where do you want to take your exam?

At a test center

OnVUE Online at my home or office

I have a Private Access Code

Where do you want to take your exam?

At a test center | OnVUE Online at my home or office | I have a Private Access Code

Prepare for your online exam at your home or office

Your computer

Use a personal computer that has a reliable webcam and internet connection.

Run system test.

Your testing space

The room should be a distraction-free, private place.

See acceptable spaces and view permitted comfort aid list.

Your photo ID

We'll verify your government-issued identification (ID) when you arrive for your exam.

Review admission & ID policies

What to expect

Check in for your OnVUE exam 30 minutes before your appointment time.

Watch our short video to get familiar with the process.

Questions?

Check out the OnVUE FAQs and minimum technical requirements.

Cart

Review and confirm contact information to avoid issues on test day.

Description	Details	Price	Actions
		165.00	Remove

Available Products

In addition to scheduling your exam, you might be interested in the following products.

Microsoft Official Practice Test powered by MeasureUp - 30 day online access
Get a discount on available Microsoft Official Practice Test for Microsoft certification exams (Fundamentals, Role-based, or Specialty) 30-day online access.

Special offer: Regularly priced at USD 99.00! Click here for details

More Details

USD 80.00

Add to Order

It’s time to test your system

Order #: 0064-8802-7606

Your appointment is confirmed! An order confirmation containing important exam day information has been sent to: zaalion@gmail.com

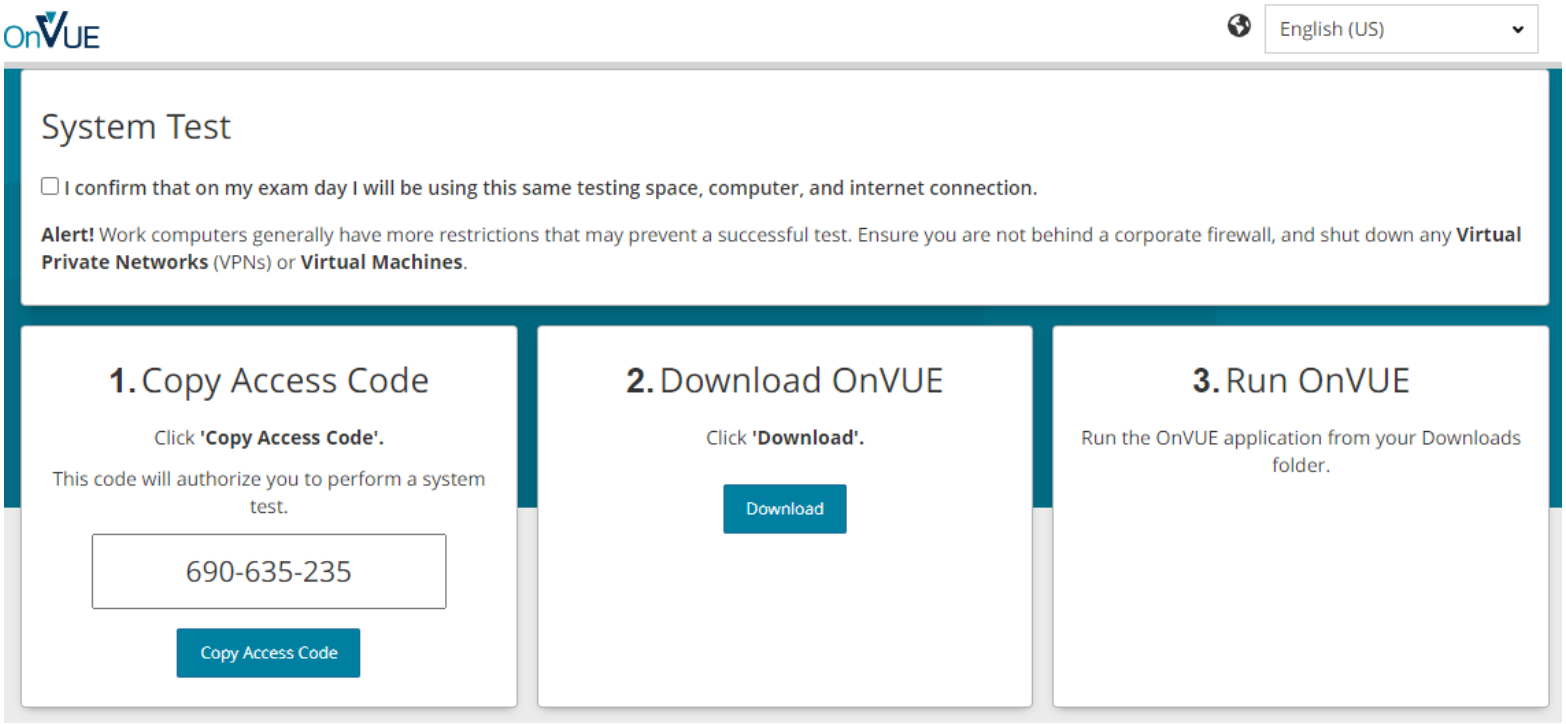
What's next?

Run a system test

We need to verify that the computer and internet connection you plan to use on exam day meet the minimum requirements for online testing. It’ll just take 5 minutes to run:

- Equipment and internet connection checks
- Exam simulation

Description	Details	Order Information	Price
			165.00


OnVUE
English (US)
System Test
I confirm that on my exam day I will be using this same testing space, computer, and internet connection.
Alert! Work computers generally have more restrictions that may prevent a successful test. Ensure you are not behind a corporate firewall, and shut down any Virtual Private Networks (VPNs) or Virtual Machines.
1. Copy Access Code
Click 'Copy Access Code'.
This code will authorize you to perform a system test.
690-635-235
Copy Access Code
2. Download OnVUE
Click 'Download'.
Download
3. Run OnVUE
Run the OnVUE application from your Downloads folder.

Course Repository

https://github.com/zaalion/oreilly-application-dev-azure

https://github.com/zaalion/oreilly-az-204

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Thank you!

Reza Salehi

@zaalion