# Certification areas (AZ-900)

| Study areas | Weight |
|---|---|
| Describe Cloud Concepts | 20-25% |
| Describe Core Azure Services | 15-20% |
| Describe Core Solutions and Management Tools | 10-15% |
| Describe General Security and Network Security | 10-15% |
| Describe Identity, Governance, Privacy and Compliance | 20-25% |
| Describe Azure cost management and Service Level Agreements | 10-15% |

- This course maps directly to the exam AZ-900 Microsoft Azure Fundamentals.
- Percentages indicate the relative weight of each area on the exam.
- The higher the percentage, the more questions you are likely to see in that area.

Microsoft

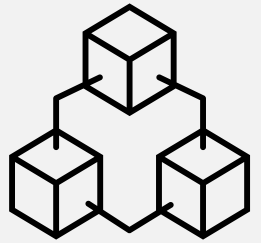
# MOD 1: Azure Cloud Concepts

# Module 01 - Outline

You will learn the following concepts:

- **Cloud Models**
  - Public, Private, and Hybrid cloud
  - Choosing the best for you
- **Cloud Benefits and Considerations**
  - Benefits of the cloud
  - Cloud considerations
- **Cloud Services**
  - IaaS, PaaS, and SaaS
  - Sharing responsibility

# Cloud Models

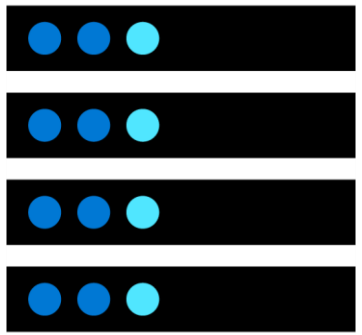


# Cloud Models - Objective Domain

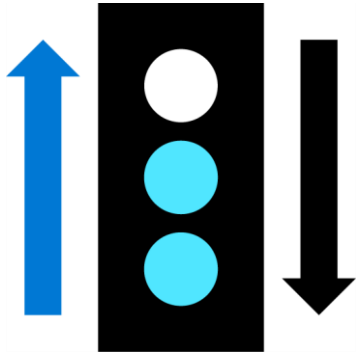
- Define cloud computing
- Describe Public cloud
- Describe Private cloud
- Describe Hybrid cloud
- Compare and contrast the three different cloud models

# What is cloud computing?

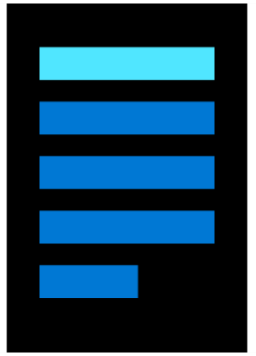
**Cloud Computing** is the delivery of computing services over the internet, enabling faster innovation, flexible resources, and economies of scale.



Compute



Networking

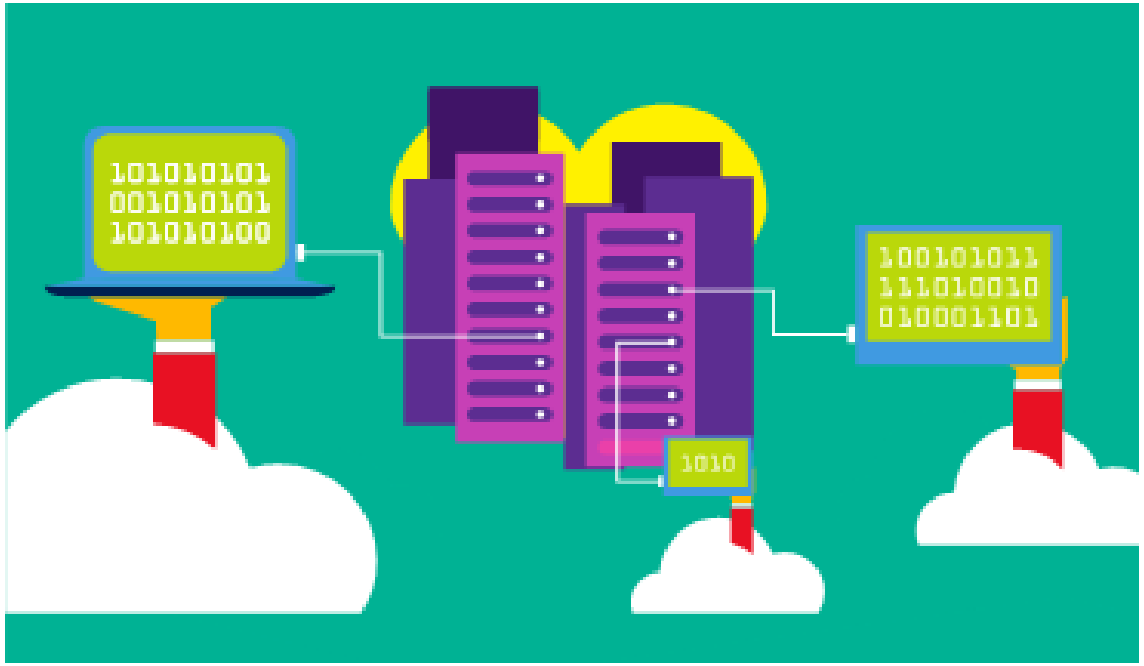


Storage

Analytics

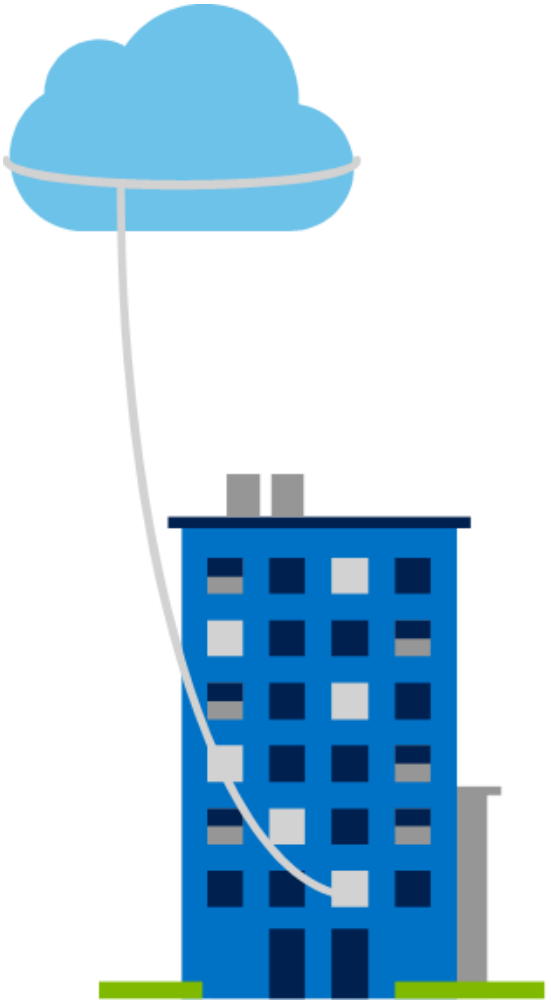
# Public cloud

- Owned by cloud services or hosting provider.
- Provides resources and services to multiple organizations and users.
- Accessed via secure network connection (typically over the internet).



# Private cloud

- Organizations create a cloud environment in their datacenter.
- Organization is responsible for operating the services they provide.
- Does not provide access to users outside of the organization.



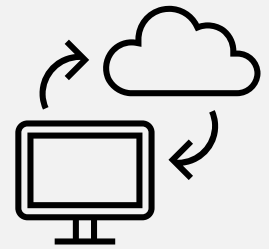
# Hybrid cloud


Combines **Public** and **Private** clouds to allow applications to run in the most appropriate location.

# Cloud model comparison

| | |
|---|---|
| Public Cloud | • No capital expenditures to scale up.<br>• Applications can be quickly provisioned and deprovisioned.<br>• Organizations pay only for what they use. |
| Private Cloud | • Hardware must be purchased for start-up and maintenance.<br>• Organizations have complete control over resources and security.<br>• Organizations are responsible for hardware maintenance and updates. |
| Hybrid Cloud | • Provides the most flexibility.<br>• Organizations determine where to run their applications.<br>• Organizations control security, compliance, or legal requirements. |

# Cloud benefits and considerations



# Cloud Benefits - Objective Domain

- Identify the benefits of cloud computing such as High Availability, Scalability, Elasticity, Agility, and Disaster Recovery.
- Identify the differences between Capital Expenditure (CapEx) and Operational Expenditure (OpEx).
- Describe the consumption-based model.

# Cloud Benefits

- High availability
- Fault tolerance
- Scalability
- Elasticity
- Global reach
- Customer latency capabilities
- Agility
- Predictive cost considerations

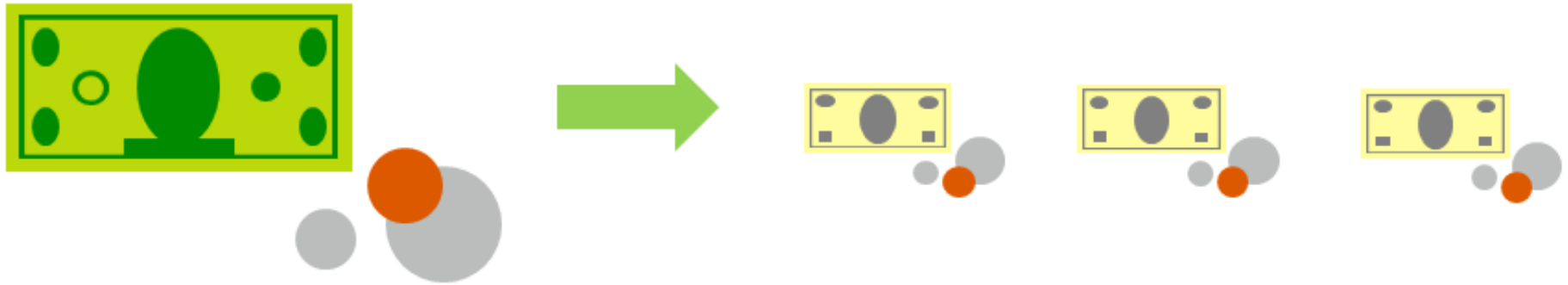
# Compare CapEx vs. OpEx

## Capital Expenditure (CapEx)

- The up-front spending of money on physical infrastructure.
- Costs from CapEx have a value that reduces over time.

## Operational Expenditure (OpEx)

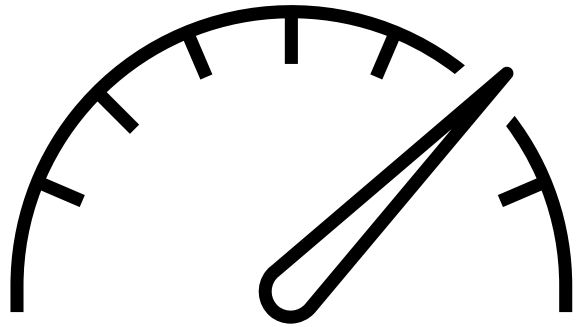
- The spending and billing of services or products as needed.
- Expenses are deducted in the same year.



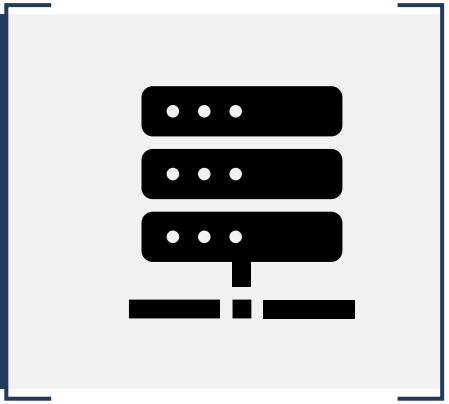
# Consumption-based model

Cloud service providers operate on a consumption-based model, which means that end users only pay for the resources that they use. Whatever they use is what they pay for.

- Better cost prediction
- Prices for individual resources and services are provided
- Billing is based on actual usage



# Cloud services

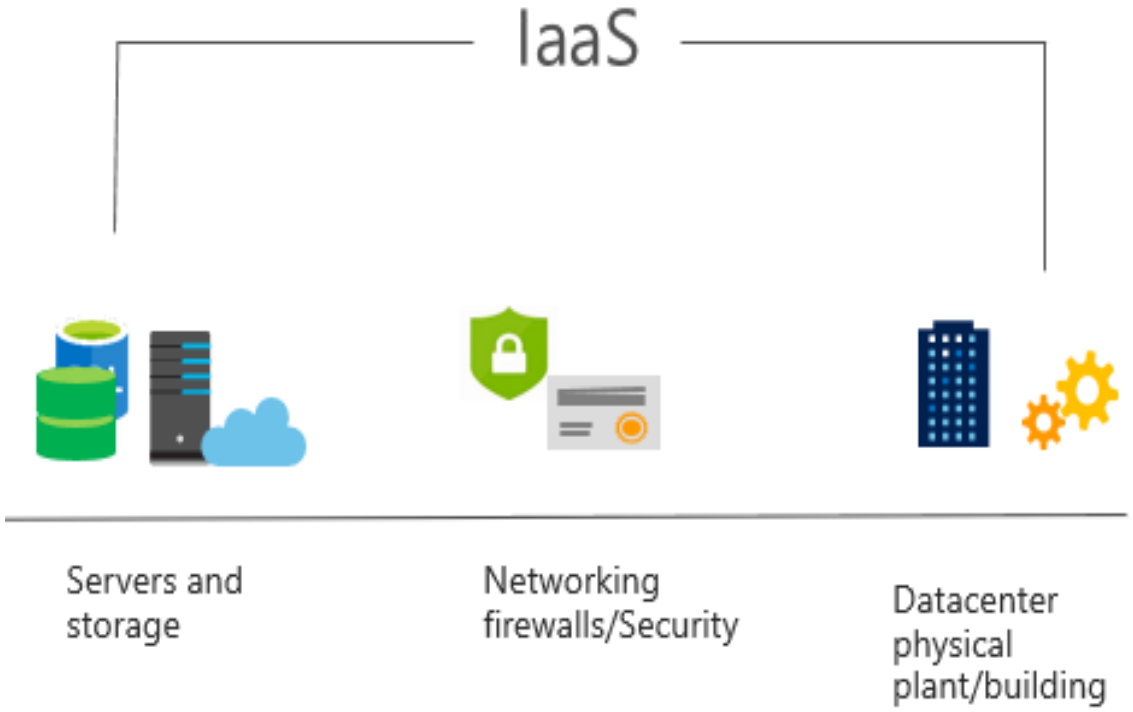


# Cloud Services - Objective Domain

- Describe Infrastructure-as-a-Service (IaaS)
- Describe Platform-as-a-Service (PaaS)
- Describe Software-as-a-Service (SaaS)
- Identify a service type based on a use case
- Describe the shared responsibility model
- Describe serverless computing

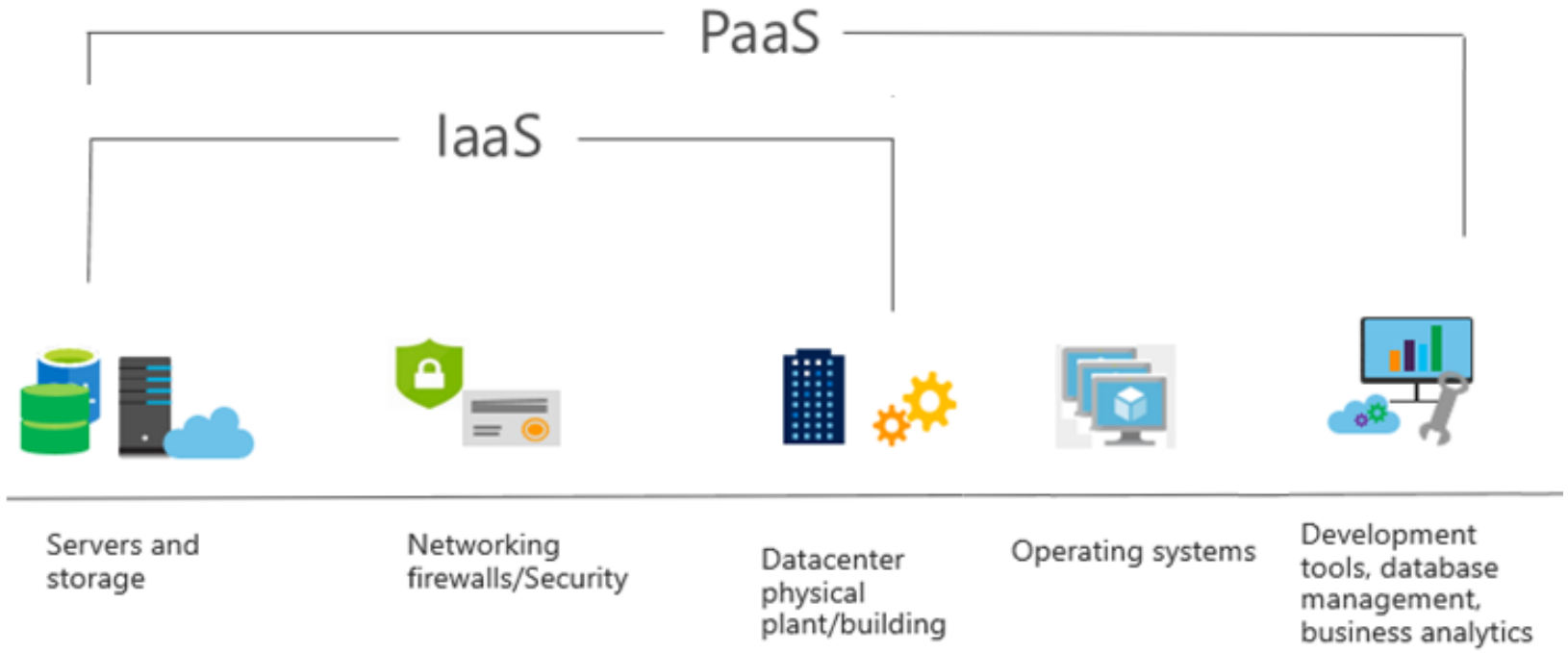
# Infrastructure as a Service (IaaS)

Build pay-as-you-go IT infrastructure by renting servers, virtual machines, storage, networks, and operating systems from a cloud provider.



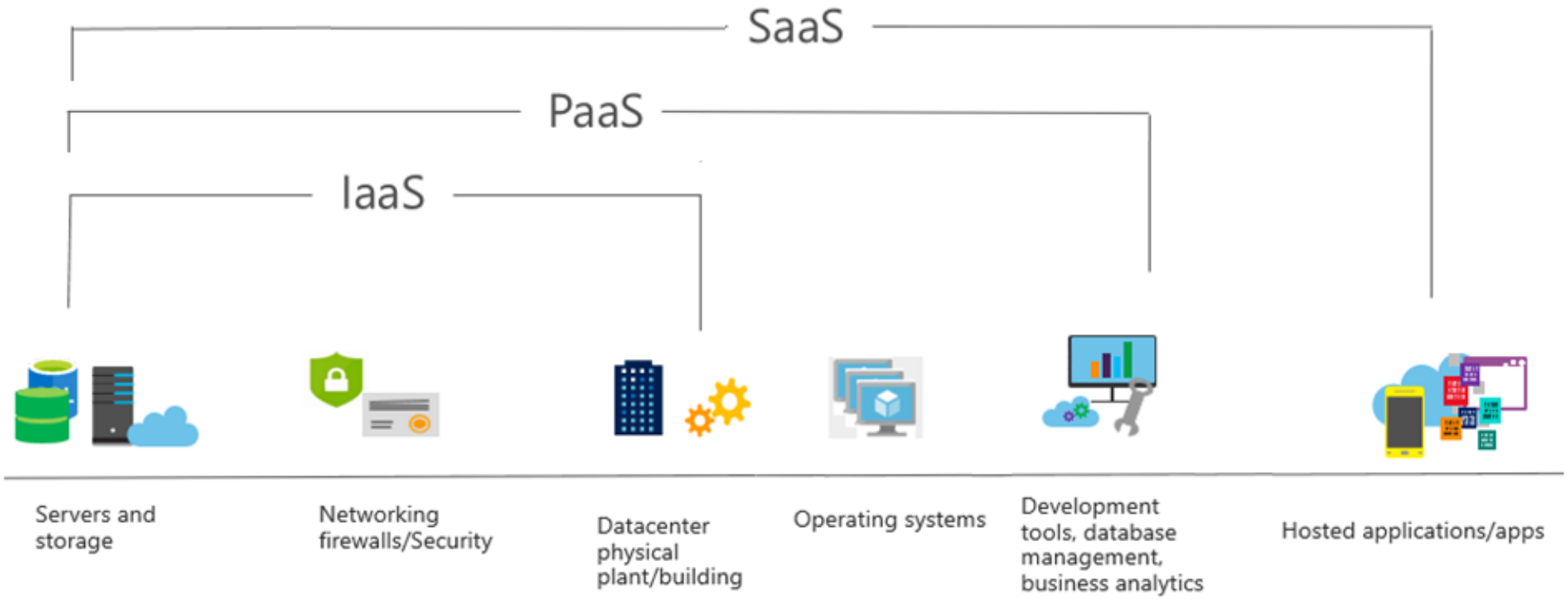
# Platform as a Service (PaaS)

Provides environment for building, testing, and deploying software applications; without focusing on managing underlying infrastructure.



# Software as a Service (SaaS)

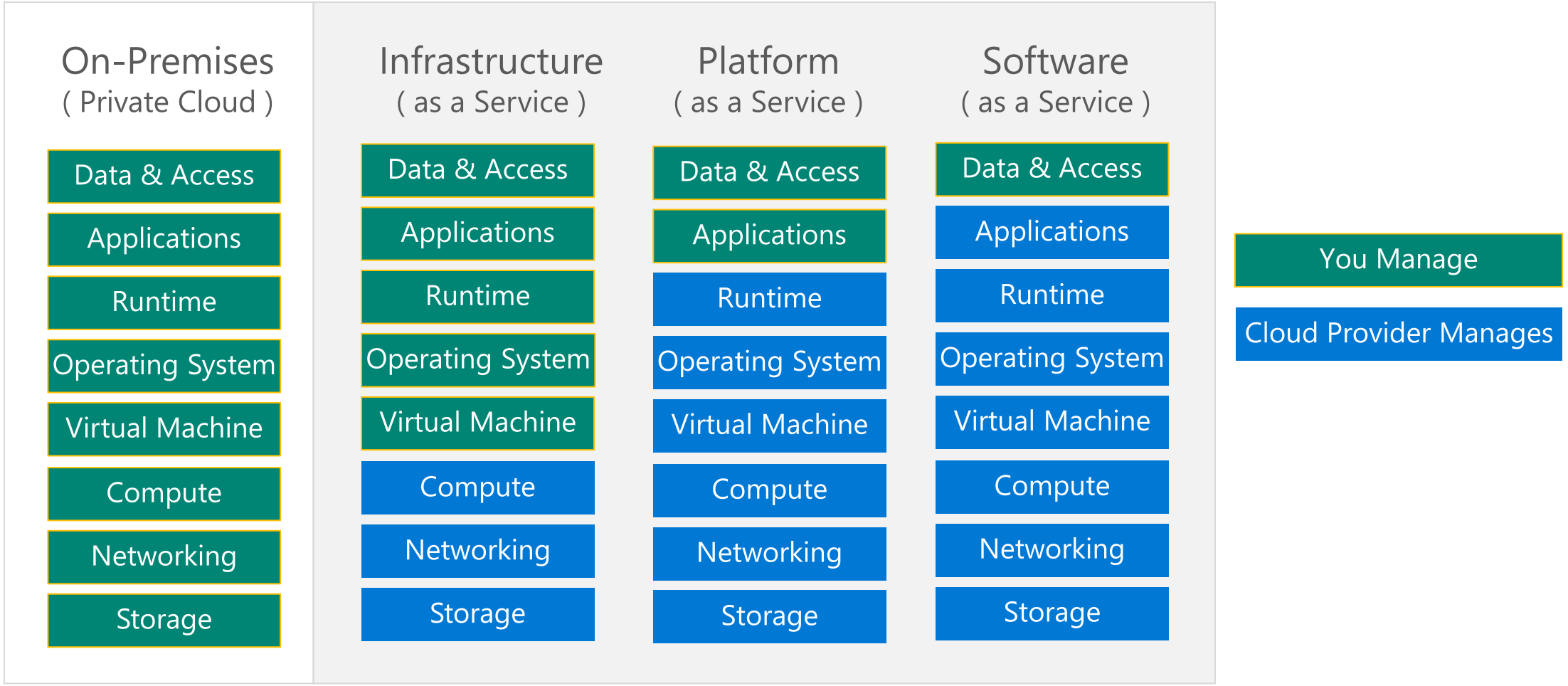
Users connect to and use cloud-based apps over the internet: for example, Microsoft Office 365, email, and calendars



# Cloud service comparison

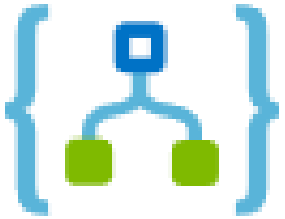
| IaaS | PaaS | SaaS |
| --- | --- | --- |
| The most flexible cloud service. | Focus on application development. | Pay-as-you-go pricing model. |
| You configure and manage the hardware for your application. | Platform management is handled by the cloud provider. | Users pay for the software they use on a subscription model. |

# Shared responsibility model



# Describe Serverless Computing

**Azure Functions** is code running your service and not the underlying platform or infrastructure. It creates infrastructure based on an event**.**



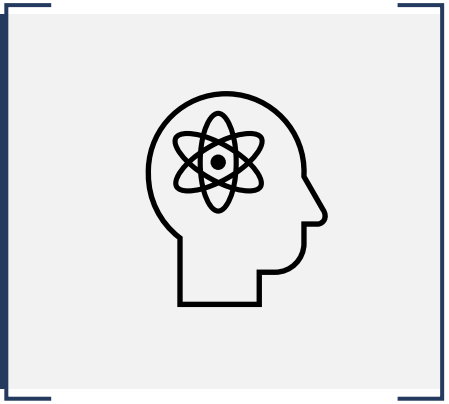
**Azure Logic Apps** is a cloud service that helps you automate and orchestrate tasks, business processes, and workflows when you need to integrate apps, data, systems, and services.

With **serverless computing applications**, the cloud service provider automatically provisions, scales, and manages the infrastructure required to run the code.

Microsoft

# MOD 2: Core Azure Services

# Module Outline

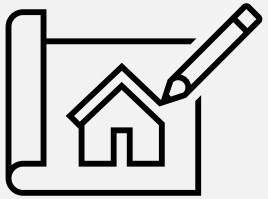


# Module 02 – Outline

You will learn the following concepts:

- **Azure Architectural Components**
  - Regions and Availability Zones
  - Subscriptions and Resource Groups
- **Core Azure Resources**
  - Compute
  - Networking
  - Storage
  - Databases

# Core Azure architectural components



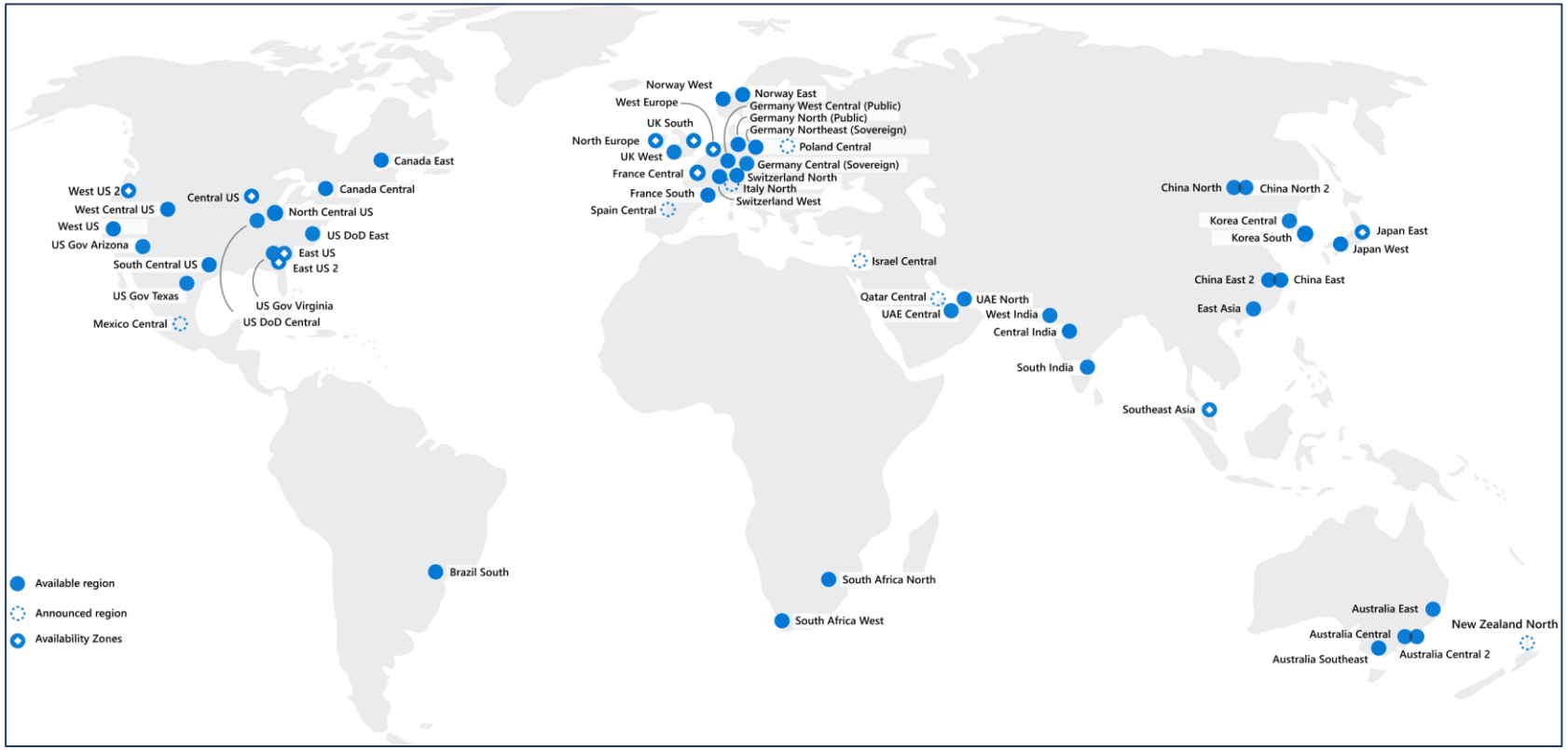
# Core Azure architectural components – Objective Domain

**Describe the benefits and usage of:**

- Regions and Region Pairs
- Availability Zones
- Azure resources
- Resource Groups
- Azure Resource Manager
- Subscriptions
- Azure Management Groups

# Regions

*Azure offers more global regions than any other cloud provider with 60+ regions representing over 140 countries*




- Regions are made up of one or more datacenters in close proximity.
- Provide flexibility and scale to reduce customer latency.
- Preserve data residency with a comprehensive compliance offering.

# Region Pairs

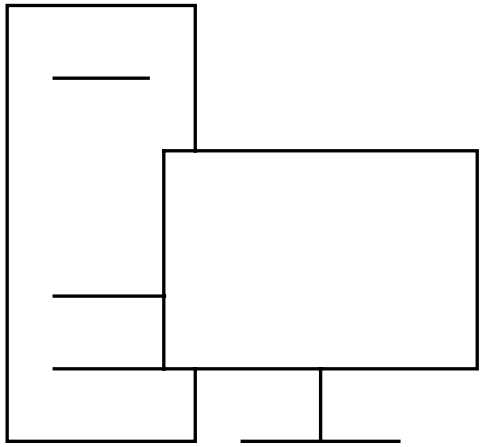
- At least 300 miles of separation between region pairs.
- Automatic replication for some services.
- Prioritized region recovery in the event of outage.
- Updates are rollout sequentially to minimize downtime.

Web Link: https://aka.ms/PairedRegions

| Region | Region |
|---|---|
| North Central US | South Central US |
| East US | West US |
| West US 2 | West Central US |
| US East 2 | Central US |
| Canada Central | Canada East |
| North Europe | West Europe |
| UK West | UK South |
| Germany Central | Germany Northeast |
| South East Asia | East Asia |
| East China | North China |
| Japan East | Japan West |
| Australia Southeast | Australia East |
| India South | India Central |
| Brazil South (Primary) | South Central US |

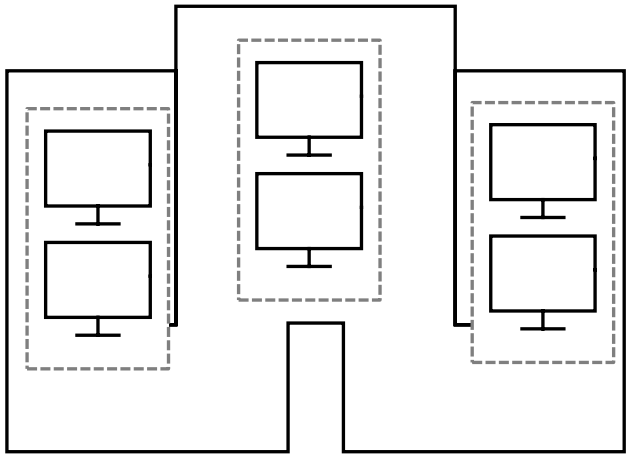
# Availability Options

**VM SLA**
99.9% with Premium Storage



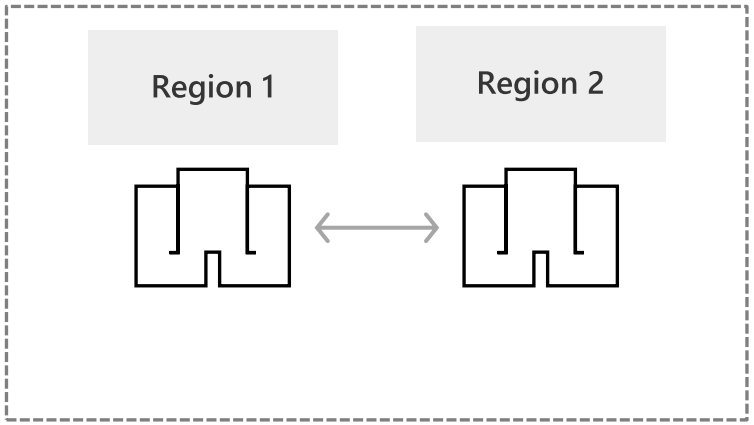
**SINGLE VM**
Easier lift and shift

**VM SLA**
99.99%



**AVAILABILITY ZONES**
Protection from entire datacenter failures

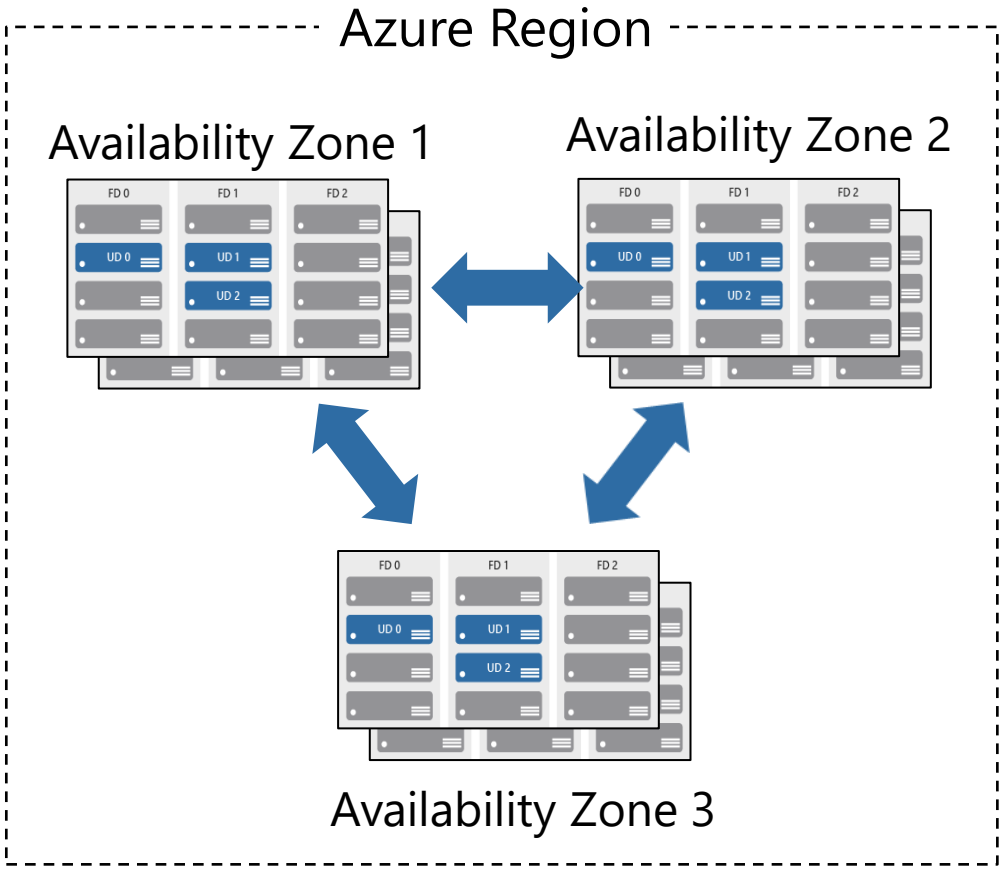
**MULTI-REGION DISASTER RECOVERY**




**REGION PAIRS**
Regional protection within Data Residency Boundaries

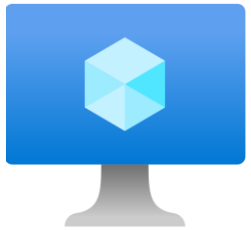
# Availability zones

- Provide protection against downtime due to datacenter failure.
- Physically separate datacenters within the same region.
- Each datacenter is equipped with independent power, cooling, and networking.
- Connected through private fiber-optic networks.



# Azure Resources

Azure **resources** are components like storage, virtual machines, and networks that are available to build cloud solutions.



Virtual Machines

Storage Accounts

Virtual Networks

App Services

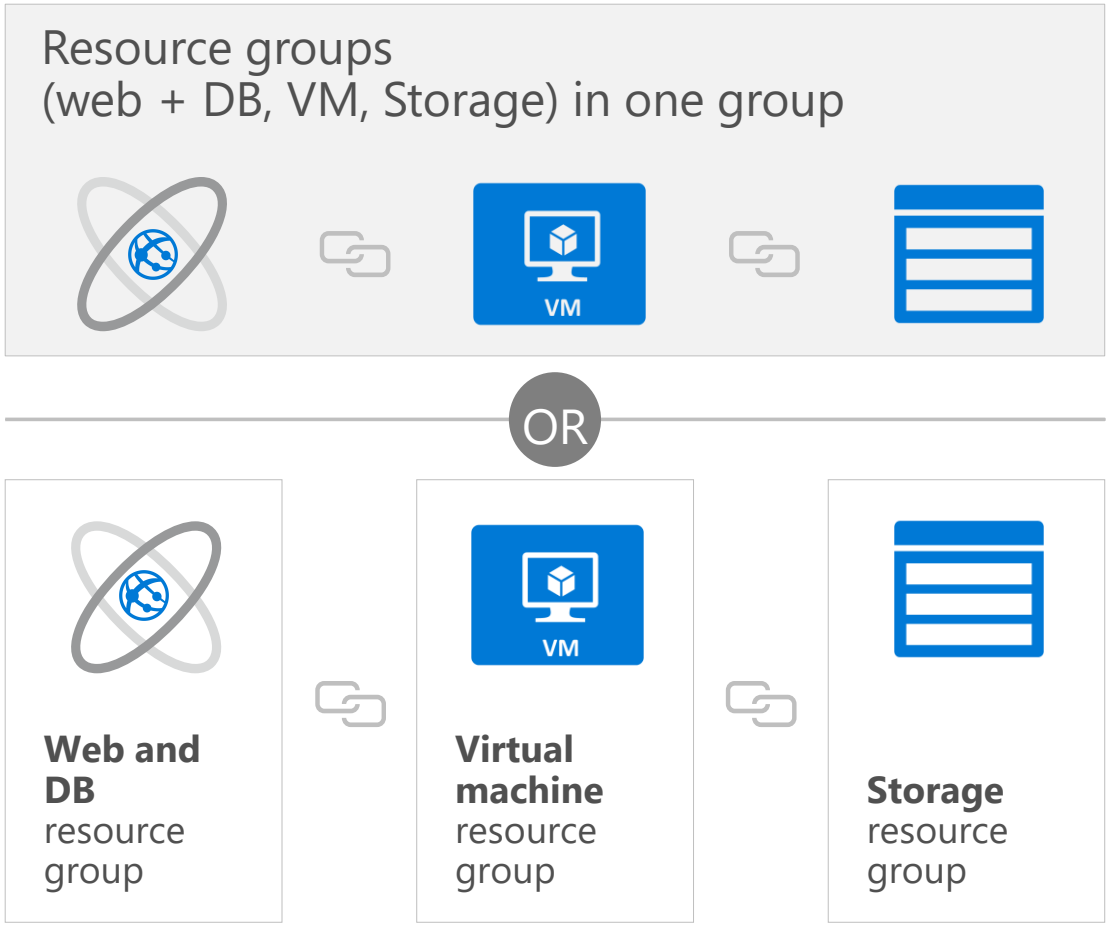

SQL Databases

Functions

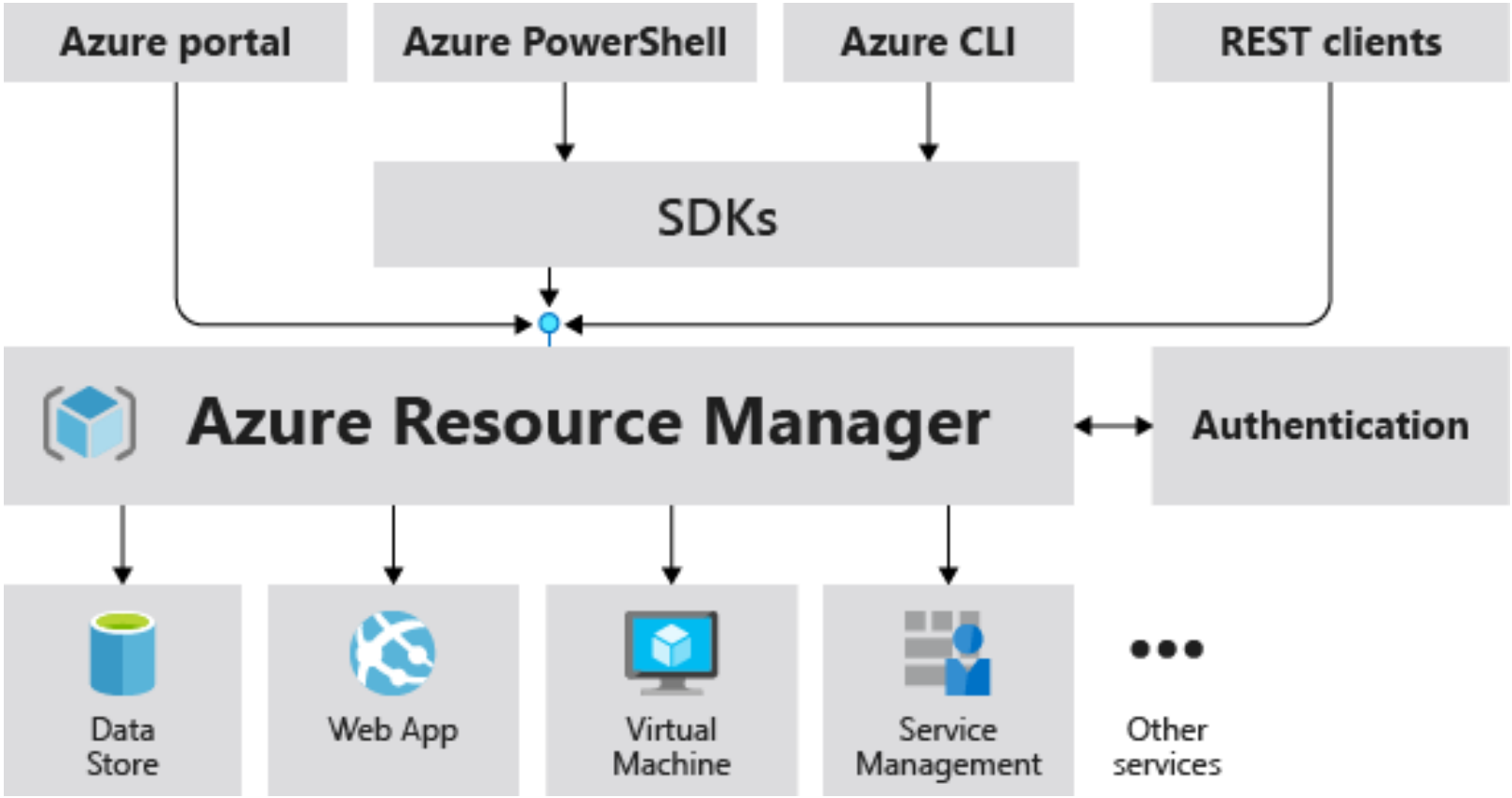
# Resource groups

A **resource group** is a container to manage and aggregate resources in a single unit.

- Resources can exist in only one resource group.
- Resources can exist in different regions.
- Resources can be moved to different resource groups.
- Applications can utilize multiple resource groups.



# Azure Resource Manager

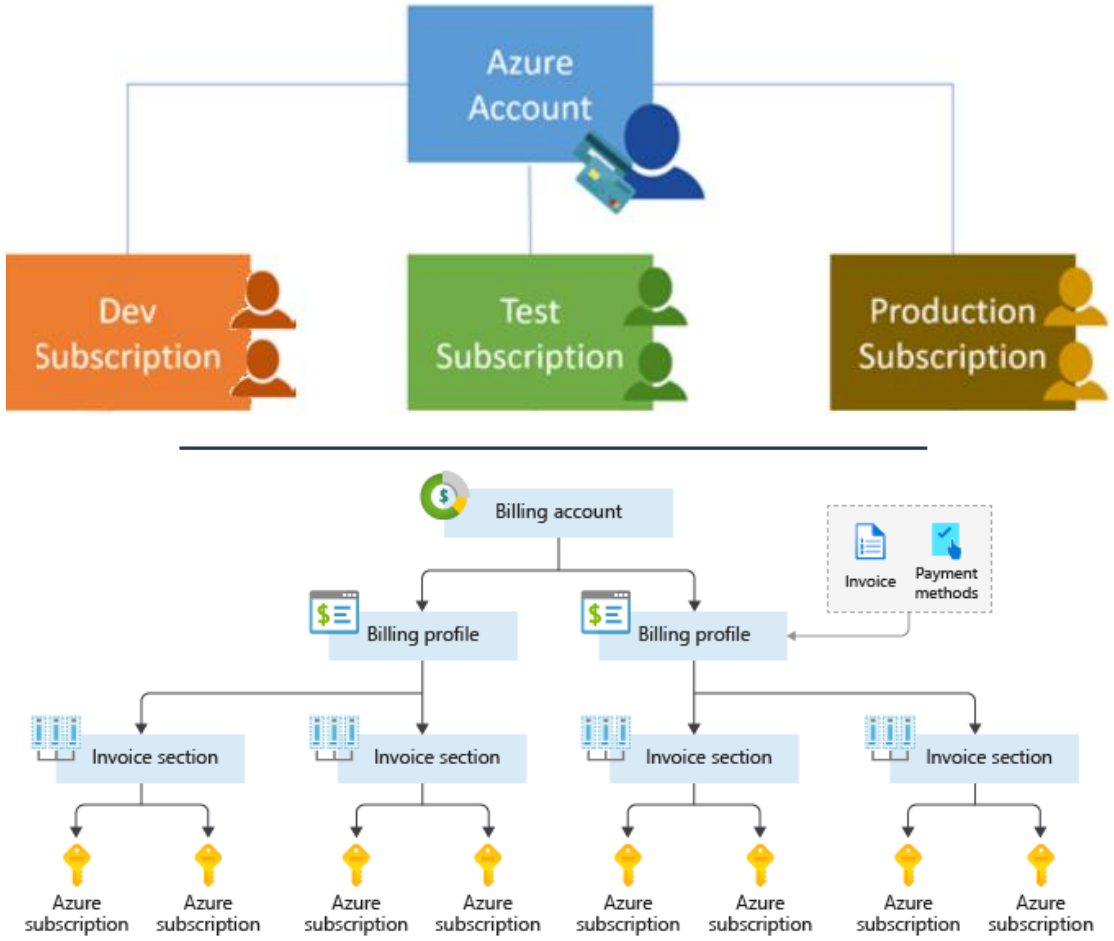



The **Azure Resource Manager (ARM)** provides a management layer that enables you to create, update, and delete resources in your Azure subscription.

# Azure Subscriptions

An Azure subscription provides you with authenticated and authorized access to Azure accounts.

- **Billing boundary:** generate separate billing reports and invoices for each subscription.
- **Access control boundary:** manage and control access to the resources that users can provision with specific subscriptions.



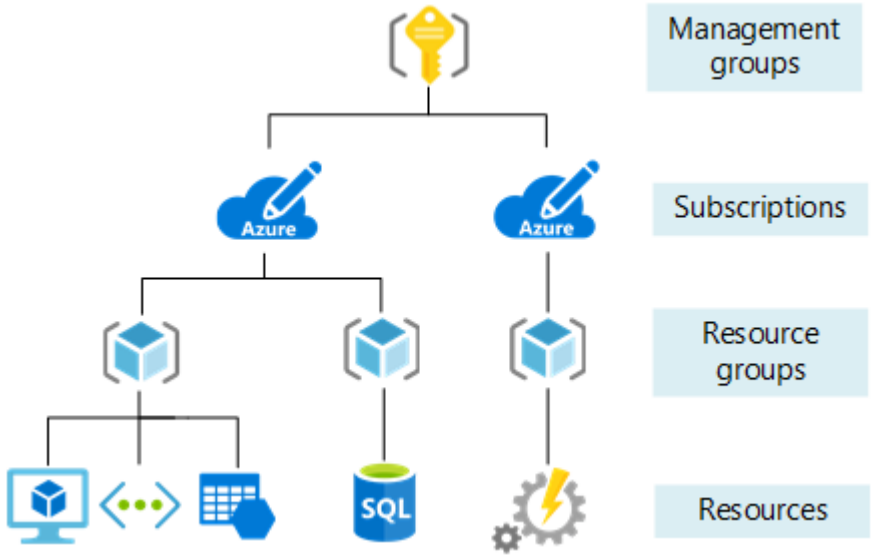
# Walkthrough – Explore the Azure Portal

**Launch the Azure Portal and have a look at the common components used everyday building cloud solutions**

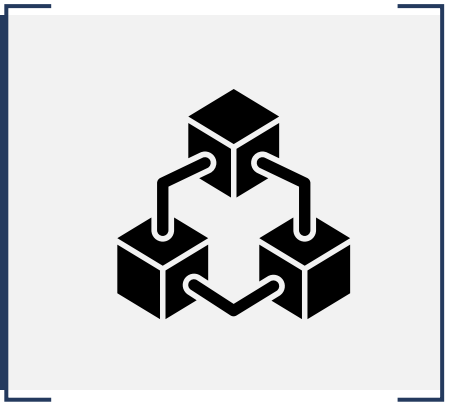
1. Connect to https://portal.azure.com
2. Explore the home screen.
3. Find “All Services” and see what is available.

# Management Groups

- Management groups can include multiple Azure subscriptions.
- Subscriptions inherit conditions applied to the management group.
- 10,000 management groups can be supported in a single directory.
- A management group tree can support up to six levels of depth.



# Core Azure workload products



# Core Azure Workloads - Objective Domain

**Describe the benefits and usage of:**

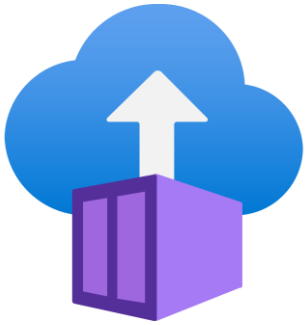
- Virtual Machines, Azure App Services, Azure Container Instances (ACI), Azure Kubernetes Service (AKS), and Windows Virtual Desktop
- Virtual Networks, VPN Gateway, Virtual Network peering, and ExpressRoute
- Container (Blob) Storage, Disk Storage, File Storage, and storage tiers
- Cosmos DB, Azure SQL Database, Azure Database for MySQL, Azure Database for PostgreSQL, and SQL Managed Instance
- Azure Marketplace

# Azure compute services

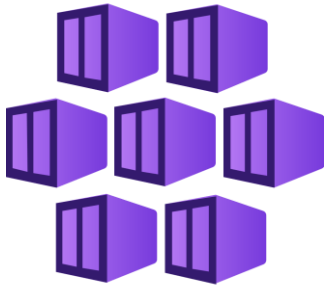
Azure **compute** is an on-demand computing service that provides computing resources such as disks, processors, memory, networking, and operating systems.

Virtual Machines

App Services



Container Instances



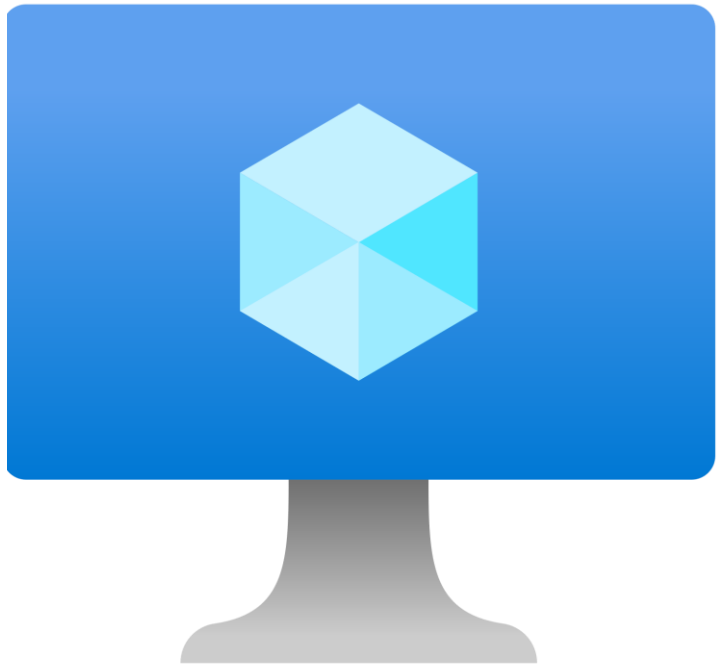
Azure Kubernetes Services (AKS)

Windows Virtual Machines

# Azure virtual machines

Azure **Virtual Machines (VM)** are software emulations of physical computers.

- Includes virtual processor, memory, storage, and networking.
- IaaS offering that provides total control and customization.



# Walkthrough – Create a Virtual Machine

**Create a virtual machine in the Azure Portal, connect to the virtual machine, install the web server role, and test.**

1. Create the virtual machine.
2. Connect to the virtual machine.
3. Install the web server role and test.

# Azure App Services

Azure **App Services** is a fully managed platform to build, deploy, and scale web apps and APIs quickly.

- Works with .Net, .NetC Core, Node.js, Java, Phython, or php.
- PaaS offering with enterprise-grade performance, security, and compliance requirements.

# Walkthrough – Create an App Service

**Create a new Web App by using a Docker image stored in Azure Container Registry.**

1. Create a Web App using a Docker image.
2. Test the Web App.

# Azure Container Services

Azure **Containers** are a light-weight, virtualized environment that does not require operating system management, and can respond to changes on demand.

**Azure Container Instances**: a PaaS offering that runs a container in Azure without the need to manage a virtual machine or additional services.

**Azure Kubernetes Service**: an orchestration service for containers with distributed architectures and large volumes of containers.

# Walkthrough - Deploy Azure Container Instances

**Using the Azure Portal create, configure, and deploy a Docker container to an Azure Container Instance. The container will deploy a Hello HTML page.**

1. Create a container instance.
2. Deploy the container and test.

# Windows Virtual Desktop

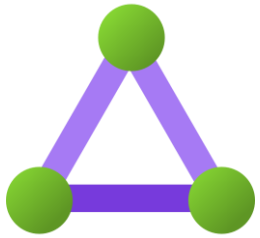
**Windows Virtual Desktop** is a desktop and app virtualization that runs in the cloud.

- Create a full desktop virtualization environment without having to run additional gateway servers.
- Publish unlimited host pools to accommodate diverse workloads.
- Reduce costs with pooled, multi-session resources.

# Azure networking services

**Azure Virtual Network (VNet)** enables Azure resources to communicate with each other, the internet, and on-premises networks.

**Virtual Private Network Gateway (VPN)** is used to send encrypted traffic between an Azure virtual network and an on-premises location over the public internet.

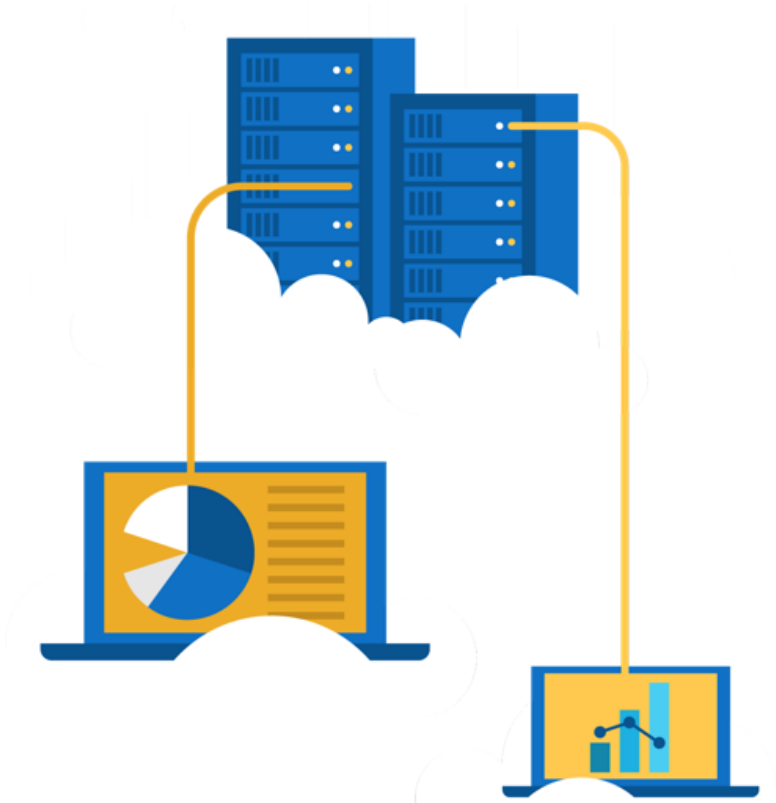


**Azure Express Route** extends on-premises networks into Azure over a private connection that is facilitated by a connectivity provider.

# Walkthrough - Create a virtual network

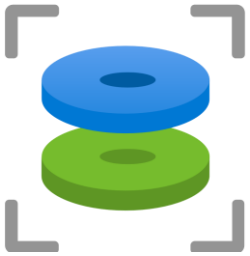
**Create a virtual network with two virtual machines and then test connection between the machines.**

1. Create a virtual network.
2. Create two virtual machines.
3. Test the connection.



# Azure storage services

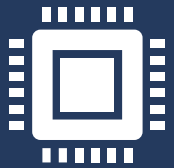
**Container storage (blob)** is optimized for storing massive amounts of unstructured data, such as text or binary data.



**Disk storage** provides disks for virtual machines, applications, and other services to access and use.

**Azure Files** sets up a highly available network file shares that can be accessed by using the standard Server Message Block (SMB) protocol.

# Azure storage access tiers

|  Hot |  Cool |  Archive |
|---|---|---|
| Optimized for storing data that is accessed frequently. | Optimized for storing data that is infrequently accessed and stored for at least 30 days. | Optimized for storing data that is rarely accessed and stored for at least 180 days with flexible latency requirements. |

You can switch between these access tiers at any time.

# Walkthrough - Create blob storage

**Create a storage account with a blob storage container. Work with blob files.**

1. Create a storage account.
2. Work with blob storage.
3. Monitor the storage account.

# Azure database services

**Azure Cosmos Database** is a globally-distributed database service that elastically and independently scales throughput and storage.


**Azure SQL Database** is a relational database as a service (DaaS) based on the latest stable version of the Microsoft SQL Server database engine.


**Azure Database for MySQL** is a fully-managed MySQL database service for app developers.

**Azure Database for PostgreSQL** is a relational database service based on the open-source Postgres database engine.

# Azure SQL Managed Instance

**Azure SQL Managed Instance** allows existing SQL Server customers to lift and shift their on-premises applications to the cloud with minimal application and database changes.

- Fully managed and evergreen platform as a service.
- Preserves all PaaS capabilities (automatic patching and version updates, automated backups, and high availability)
- Exchange existing licenses for discounted rates on SQL Managed Instance using the Azure Hybrid Benefit

# Walkthrough-Create a SQL database

**Create a SQL database in Azure and then query the data in that database.**

1. Create the database.
2. Query the database.

# Explore Azure Marketplace

**Azure Marketplace** allows customers to find, try, purchase, and provision applications and services from hundreds of leading service providers, which are all certified to run on Azure.

- Open source container platforms.
- Virtual machine and database images.
- Application build and deployment software.
- Developer tools.
- And much more, with 10,000+ listings!

# Module 02 Review

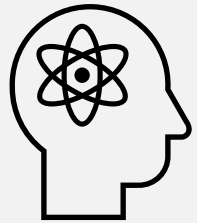
Microsoft Learn Modules
(docs.microsoft.com/Learn)

- Microsoft provides more global presence than any other cloud provider with over 60 regions distributed worldwide
- Azure Management tools
- Azure's multiple services (compute, networking, storage, and databases)
- Azure Marketplace

Microsoft

# MOD 3: Azure Solutions and Management Tools

# Module Outline

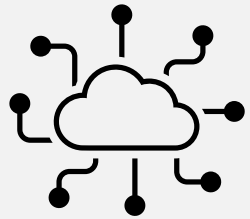


# Module 03 – Outline

You will learn the following concepts:

- **Core Azure solutions**
  - IoT to Azure Sphere
  - Synapse Analytics to Databricks
  - AI / ML
- **Azure management tools**
  - Portal, PowerShell, CLI, and others
  - Advisor, Monitor, and Service Health

# Azure solutions



# Azure Solutions - Objective Domain

**Describe the benefits and usage of:**

- Internet of Things (IoT) Hub, IoT Central, and Azure Sphere
- Azure Synapse Analytics, HDInsight, and Azure Databricks
- Azure Machine Learning, Cognitive Services, and Azure Bot Service
- Serverless computing solutions that include Azure Functions and Logic Apps
- Azure DevOps, GitHub, GitHub Actions, and Azure DevTest Labs

# Azure Internet of Things

**Internet of Things (IoT)** is the ability for devices to garner and then relay information for data analysis.

**Azure IoT Central** is a fully managed global IoT SaaS solution that makes it easy to connect, monitor, and manage IoT assets at scale.

**Azure IoT Hub** is a managed service hosted in the cloud that acts as a central message hub for bi-directional communication between IoT applications and the devices it manages.

**Azure Sphere** is a secured, high-level application platform with built-in communication and security features for internet-connected devices.

# Walkthrough - Implement the Azure IoT Hub

**Create an Azure IoT Hub in Azure Portal and configure the hub to authenticate a connection to an IoT device using the Raspberry Pi device simulator.**

1. Create an IoT Hub.
2. Add an IoT device.
3. Test the device using the Raspberry Pi Simulator.

# Big data and analytics

## Azure Synapse Analytics

A cloud-based Enterprise Data Warehouse.

## Azure HDInsight

A fully-managed, open-source analytics service for enterprises.

## Azure  Databricks

Apache Spark based analytics service.

# Artificial Intelligence & Machine Learning

**Azure Machine Learning:** cloud-based to develop, train, and deploy machine learning models.

**Cognitive Services:** quickly enable apps to see, hear, speak, understand, and interpret a user's needs.

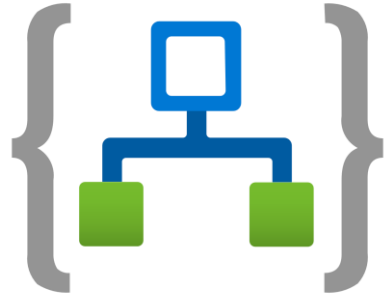
**Azure Bot Service:** develop intelligent, enterprise-grade bots.

# Serverless Computing

## Azure Functions

Event based code running your service and not the underlying infrastructure.

## Azure Logic Apps

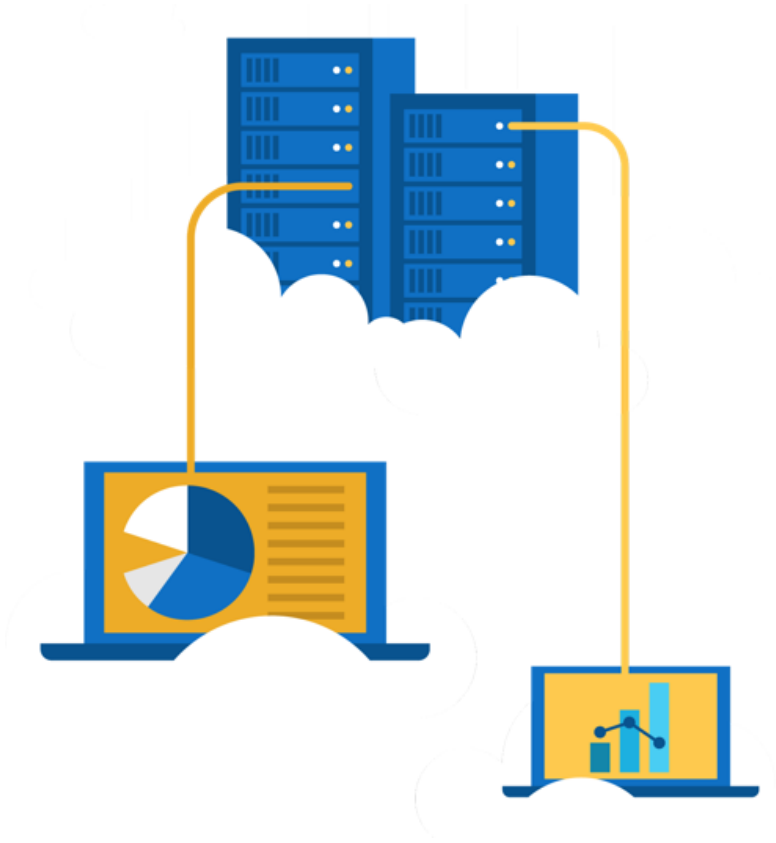


Automate and orchestrate tasks, business processes, and workflows to integrate apps.

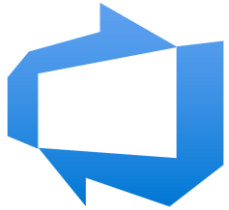
# Walkthrough - Implement Azure Functions

**Create a Function app with a Webhook to provide a Hello message with your name.**

1. Create a Function app.
2. Create a HTTP triggered event function and test.

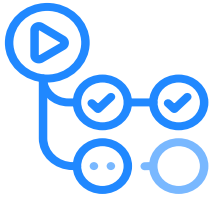


# Develop your apps with DevOps and GitHub



**Azure DevOps:** development collaboration tools including pipelines, Kanban boards, and automated cloud-based load testing.

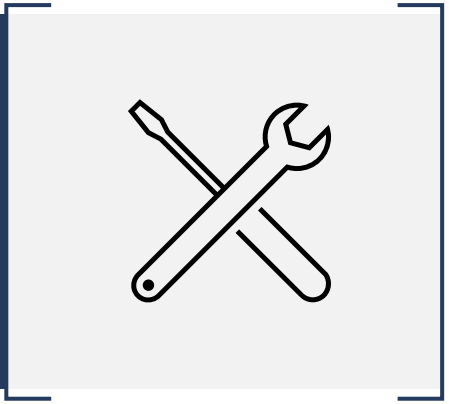
**GitHub:** software development hosting with version control, source code management, and bug/task management.



**GitHub Actions for Azure:** automate software workflow to build, test, and deploy from withing GitHub.

**Azure DevTest Labs:** quickly create environments in Azure while minimizing waste and controlling cost.

# Azure management tools

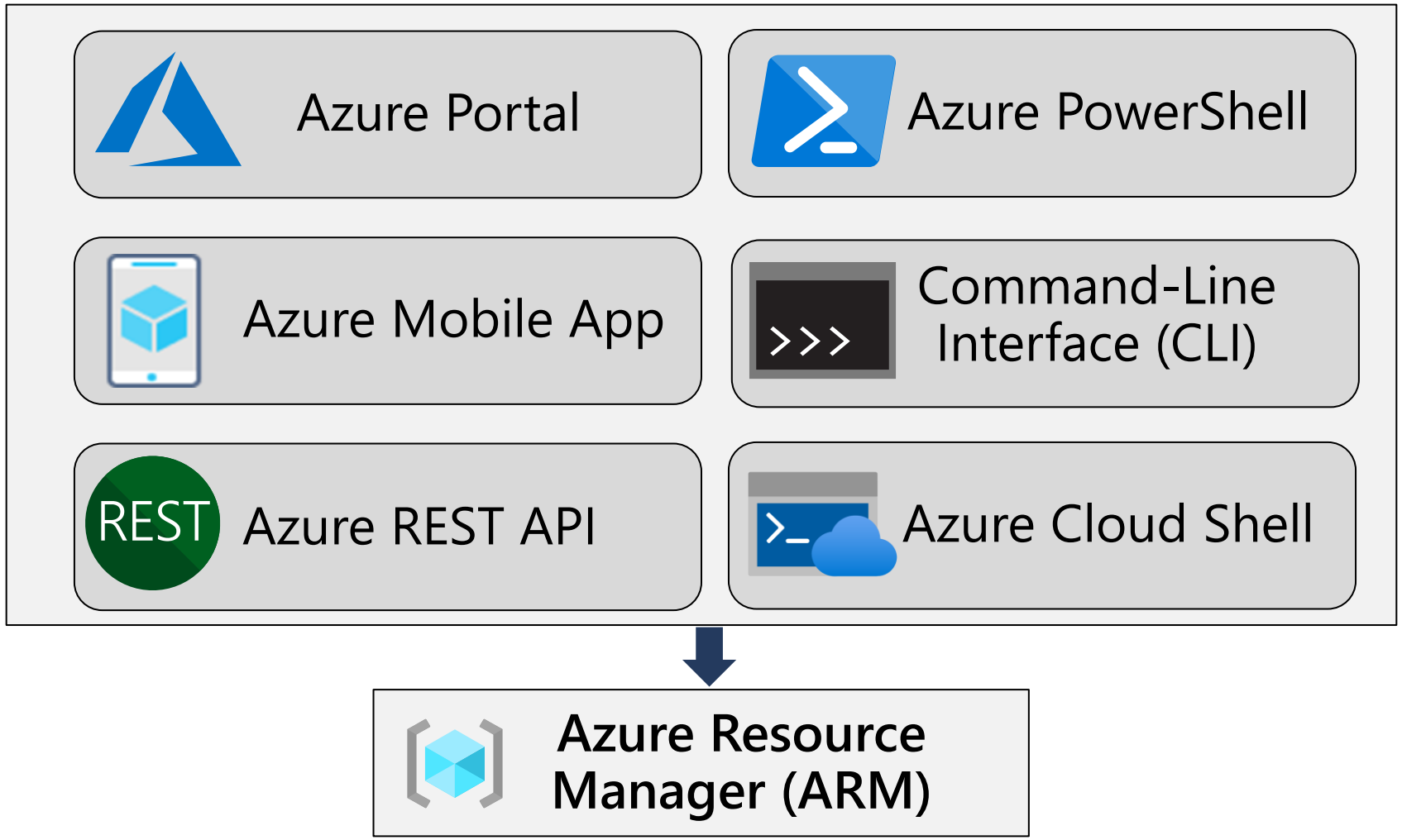


# Azure Management Tools - Objective Domain

**Describe the functionality and usage of:**

- Azure Portal, Azure PowerShell, Azure CLI, Cloud Shell, and Azure Mobile App.
- Azure Advisor.
- Azure Resource Manager (ARM) templates.
- Azure Monitor.
- Azure Service Health.

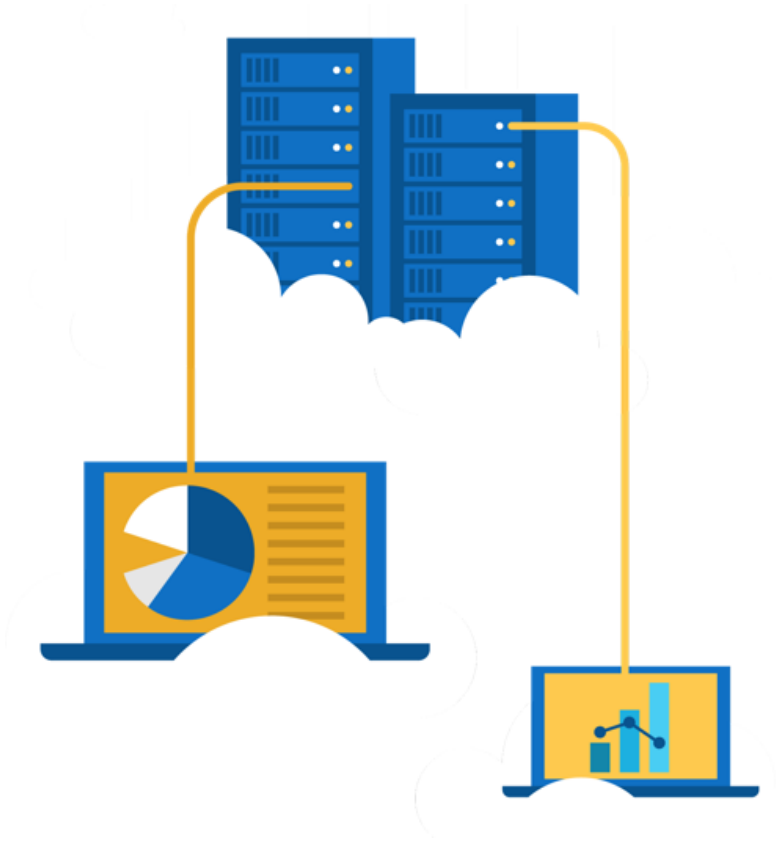
# Azure management tools



# Walkthrough – Create a VM with an ARM Template

**Use the Azure QuickStart gallery to deploy a template that creates a virtual machine.**

1. Explore the gallery and deploy a template.
2. Verify your virtual machine deployment.



# Walkthrough - Create a VM with PowerShell

**Install PowerShell locally, create a resource group and virtual machine, access and use the Cloud Shell, and review Azure Advisor recommendations.**

Use PowerShell to create a resource group and virtual machine.

1. Execute PowerShell commands in the Cloud Shell.
2. Review Azure Advisor Recommendations.

# Walkthrough - Create a VM with the Azure CLI

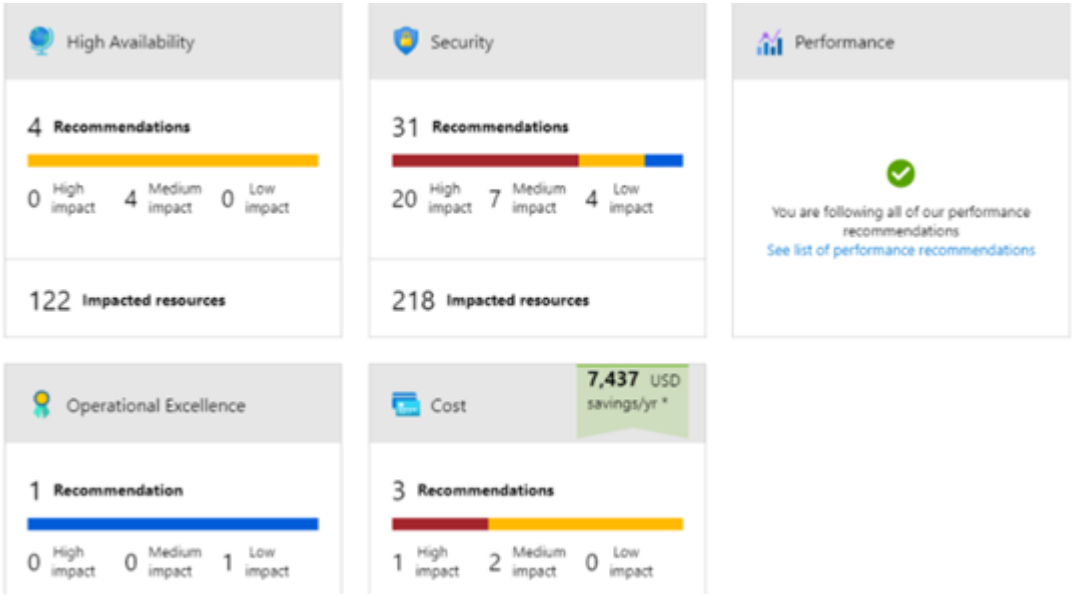
**Install the Azure CLI locally, create a resource group and virtual machine, use the Cloud Shell, and review Azure Advisor recommendations.**

1. Install the CLI locally.
2. Use the CLI to create a resource group and virtual machine.
3. Execute commands in the Cloud Shell.
4. Review Azure Advisor Recommendations.

# Azure Advisor

**Azure Advisor** analyzes deployed Azure resources and makes recommendations based on best practices to optimize Azure deployments.

- Reliability
- Security
- Performance
- Cost
- Operational Excellence

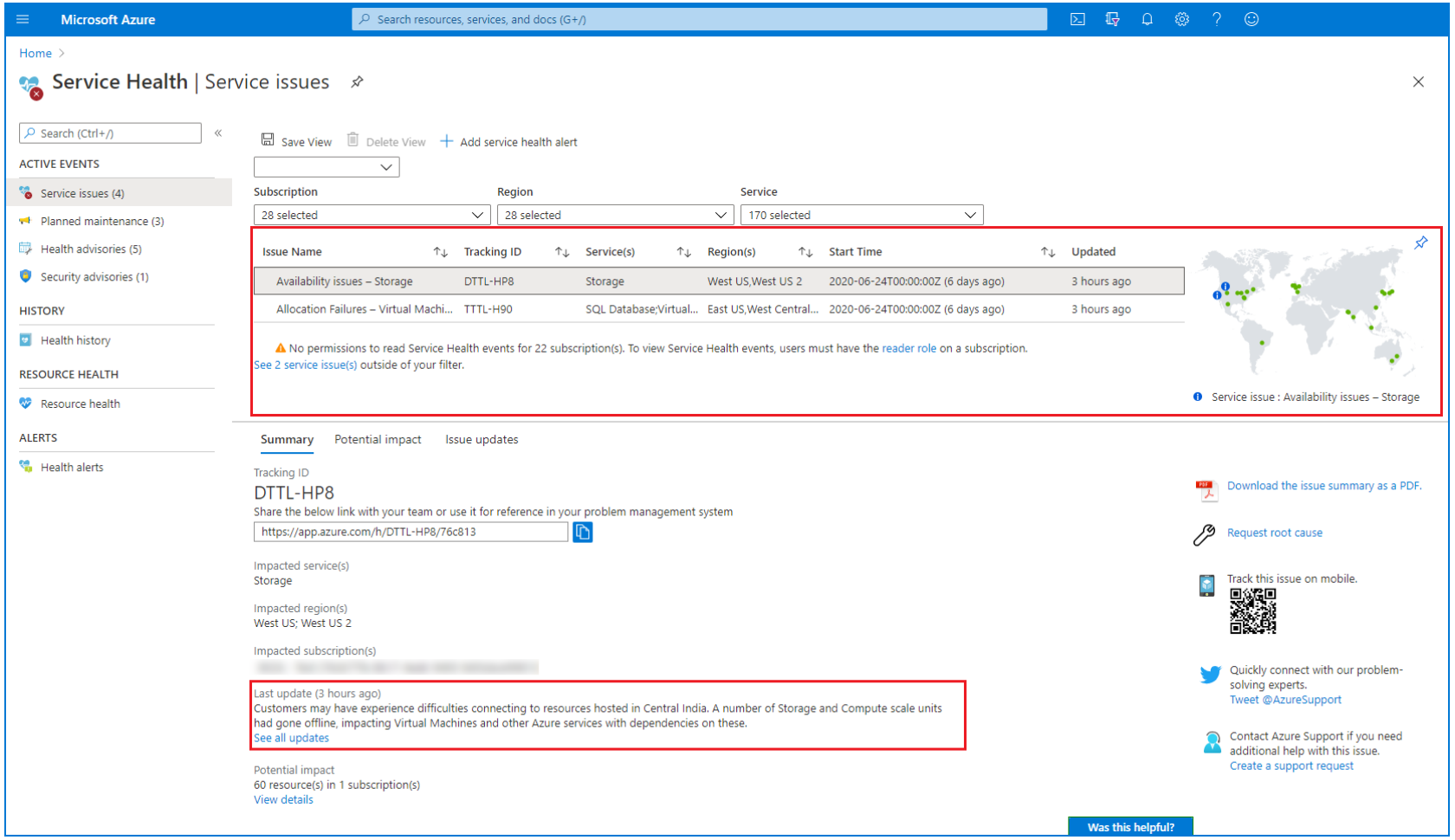


# Azure Monitor

**Azure Monitor** maximizes the availability and performance of applications and services by collecting, analyzing, and acting on telemetry from cloud and on-premises environments.

- Application Insights
- Log Analytics
- Smart Alerts
- Automation Actions
- Customized Dashboards

# Azure Service Health




Evaluate the impact of Azure service issues with personalized guidance and support, notifications, and issue resolution updates.

# Azure Service Health

**Azure Service Health** provides a personalized view of the health of Azure services and the regions being used.

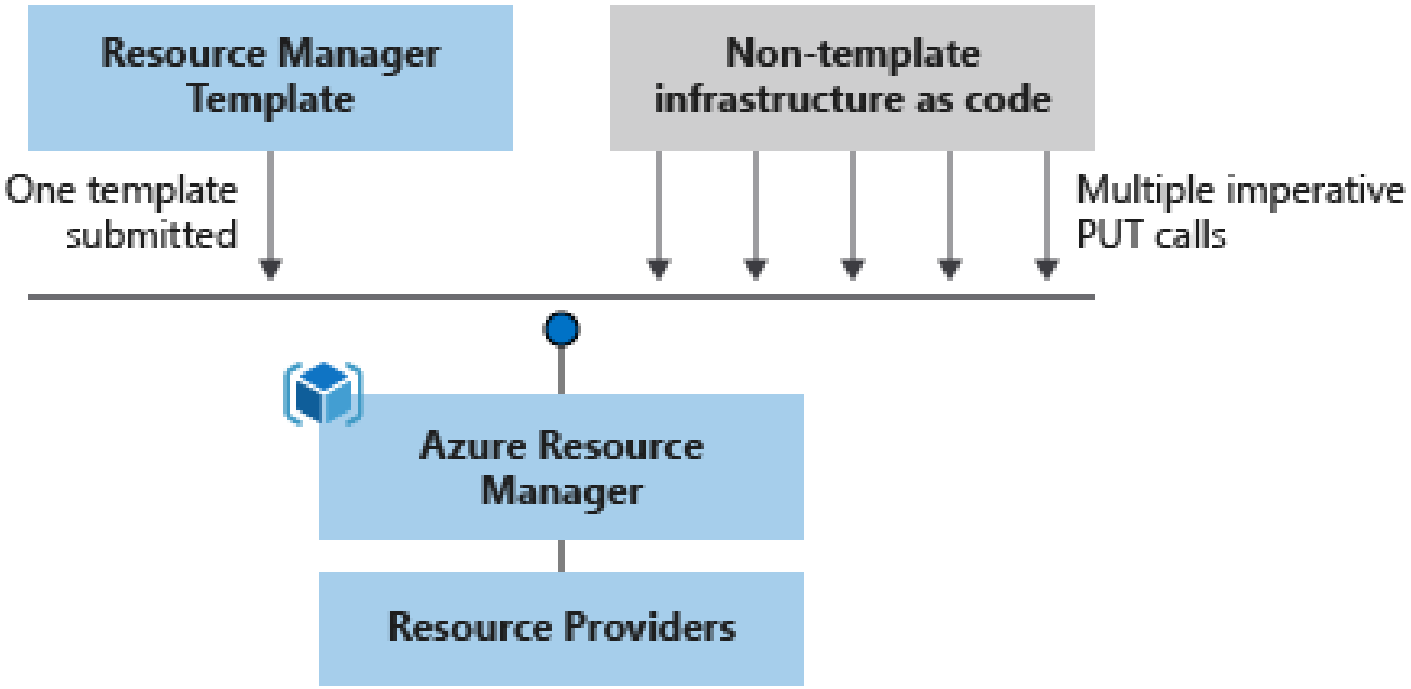
- Communication regarding outages
- Planned maintenance
- Other health advisories

| Microsoft Azure | Health Advisory Summary | 2020-08-22T19:43:35Z |
|---|---|---|
| **Title:** | We have important information regarding your ExpressRoute service | |
| **Tracking ID:** | PLWN-F80 | |
| **Event type:** | Health Advisory | |
| **Status:** | Ongoing as of 2020-08-22T19:43:34Z | |
| **Service(s):** | ExpressRoute \ ExpressRoute Circuits | |
| **Region(s):** | Australia Central, Australia Central 2, Australia East, Australia Southeast, Brazil South, Canada Central, Canada East, Central India, Central US, Central US EUAP, East Asia, East US, East US 2, East US 2 EUAP, France Central, France South, Germany North, Germany West Central, Global, Japan East, Japan West, Korea Central, Korea South, North Central US, North Europe, South Africa North, South Africa West, South Central US, Southeast Asia, South India, Switzerland North, Switzerland West, UAE Central, UAE North, UK South, UK West, West Central US, West Europe, West India, West US, West US 2 | |
| **Start time:** | 2020-08-18T00:00:00Z | |
| **Resolve time:** | Ongoing as of 2020-08-22T19:43:34Z | |
| **Last update time:** | 2020-08-19T07:19:29Z | |
| **Impacted subscriptions:** | 5733bcb3-7fde-4caf-8629-41dc15e3b352 (Contoso Hotels) | |

# Azure Resource Manager (ARM) templates

**Azure Resource Manager (ARM)** templates are JavaScript Object Notation (JSON) files that can be used to create and deploy Azure infrastructure without having to write programing commands.

- Declarative syntax
- Repeatable results
- Orchestration
- Modular files
- Built-in validation
- Exportable code



# Module 03 Review

Microsoft Learn Modules
(docs.microsoft.com/Learn)

- Azure services: IoT, big data, analytics, and development tools.
- Azure Resource Manager.
- Azure Monitoring tools.