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

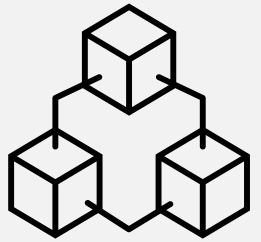
MOD 1: Azure Cloud Concepts

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

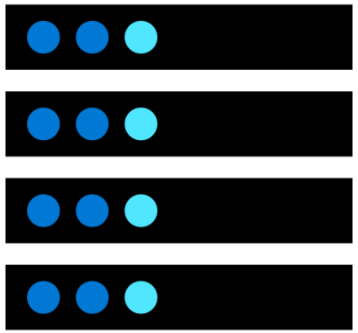


Cloud Models - Objective Domain

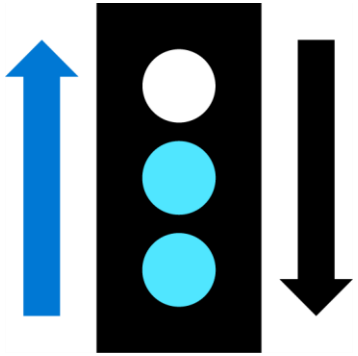
- Define cloud computing
- Describe Public cloud
- Describe Private cloud
- Describe Hybrid cloud
- Compare and contrast the three different cloud models

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



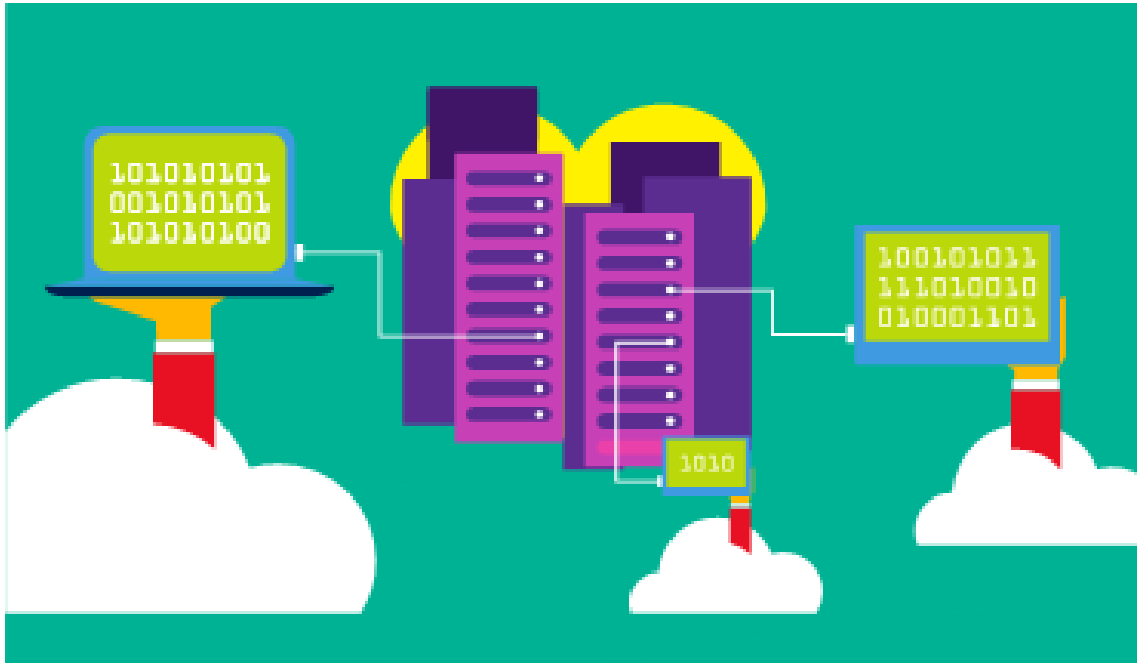
Networking

Storage

Analytics

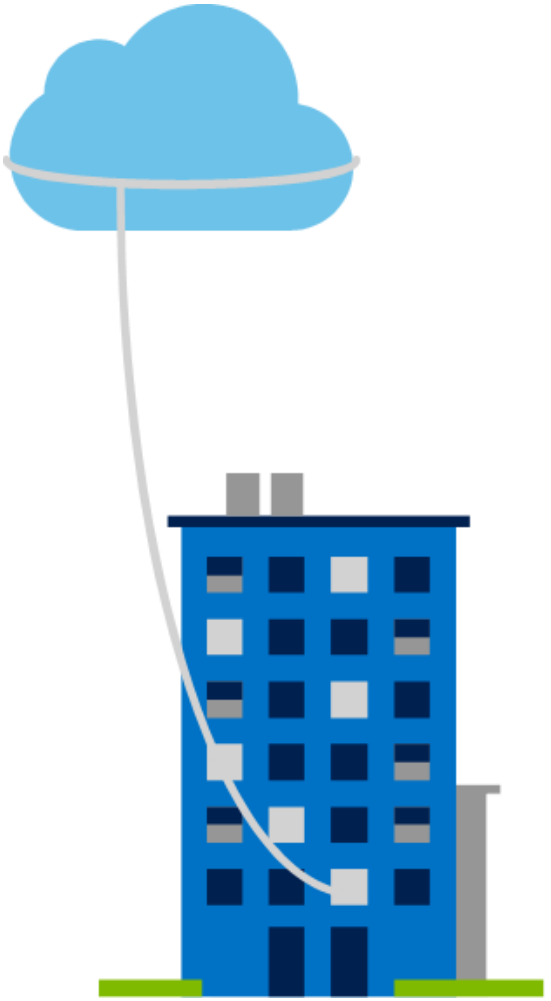
Public cloud

- 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. • Applications can be quickly provisioned and deprovisioned. • Organizations pay only for what they use.
Private Cloud	• Hardware must be purchased for start-up and maintenance. • Organizations have complete control over resources and security. • Organizations are responsible for hardware maintenance and updates.
Hybrid Cloud	• Provides the most flexibility. • Organizations determine where to run their applications. • 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

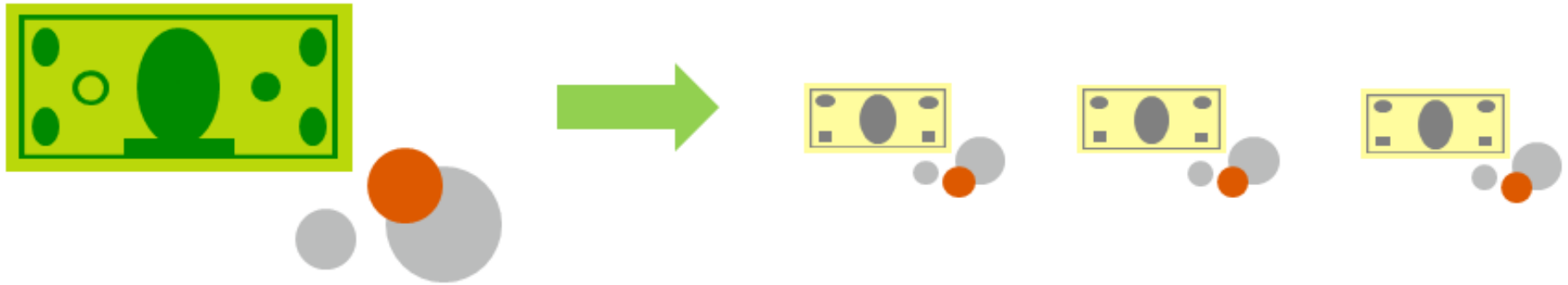
Compare CapEx vs. OpEx

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)

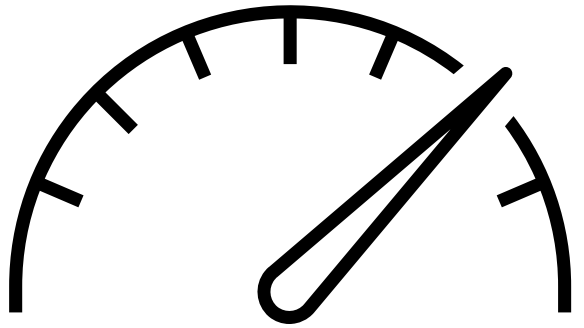
- The spending and billing of services or products as needed.
- Expenses are deducted in the same year.



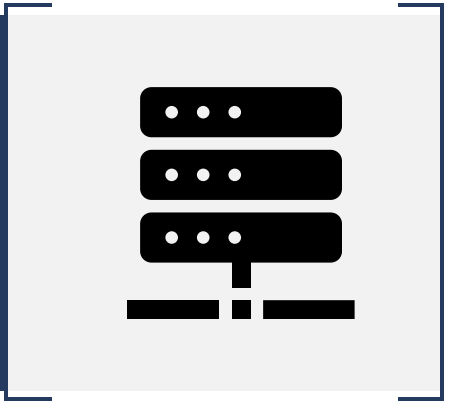
Consumption-based model

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

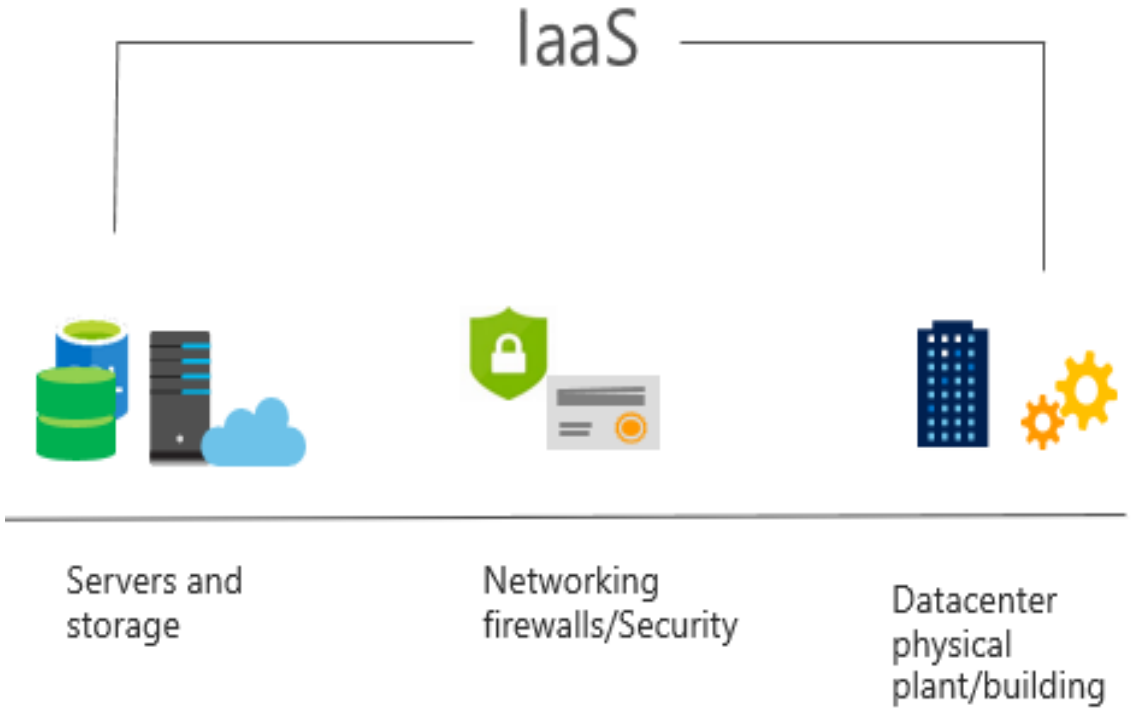


Cloud Services - Objective Domain

- 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

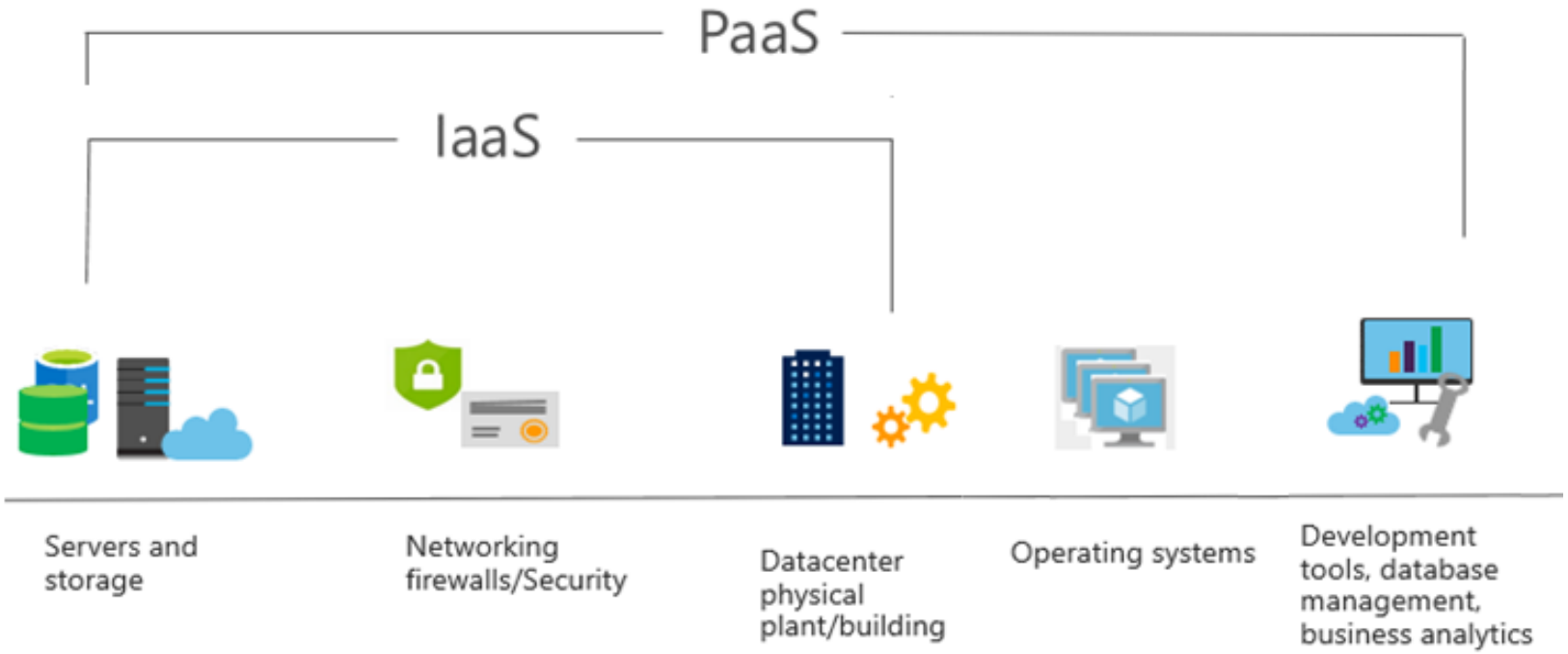
Infrastructure as a Service (IaaS)

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



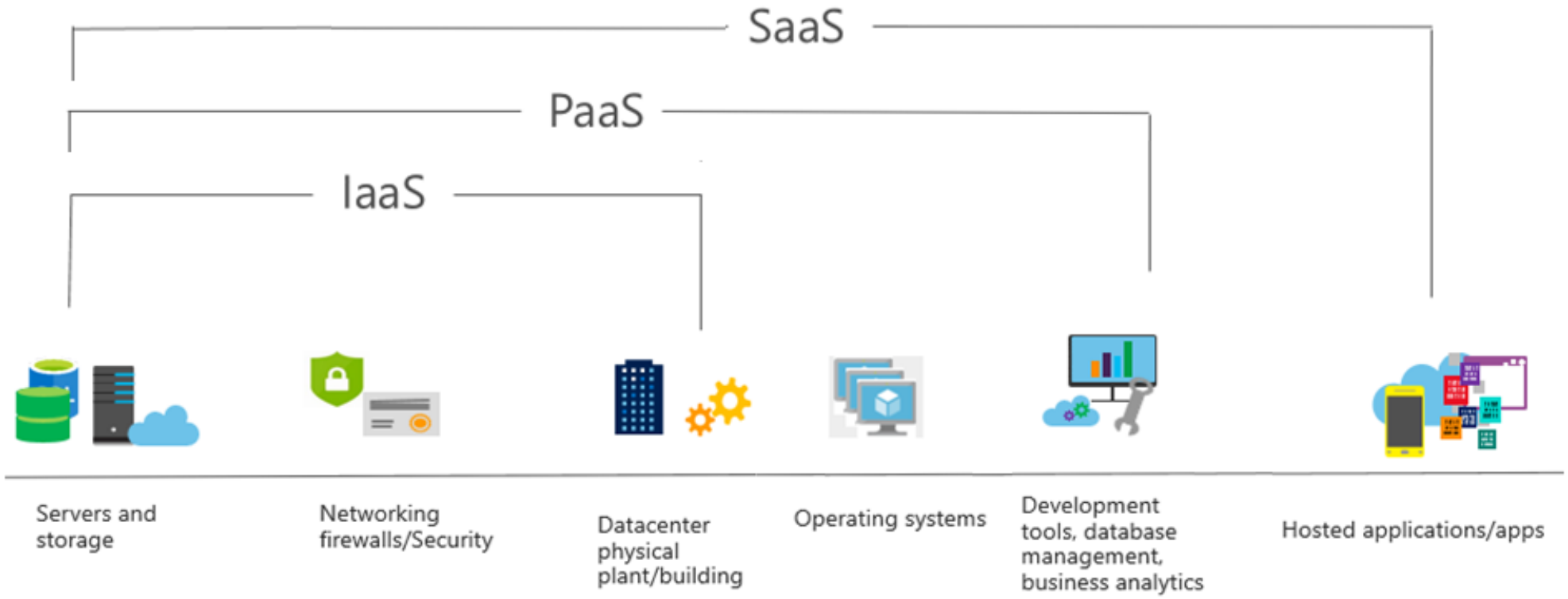
Platform as a Service (PaaS)

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



Software as a Service (SaaS)

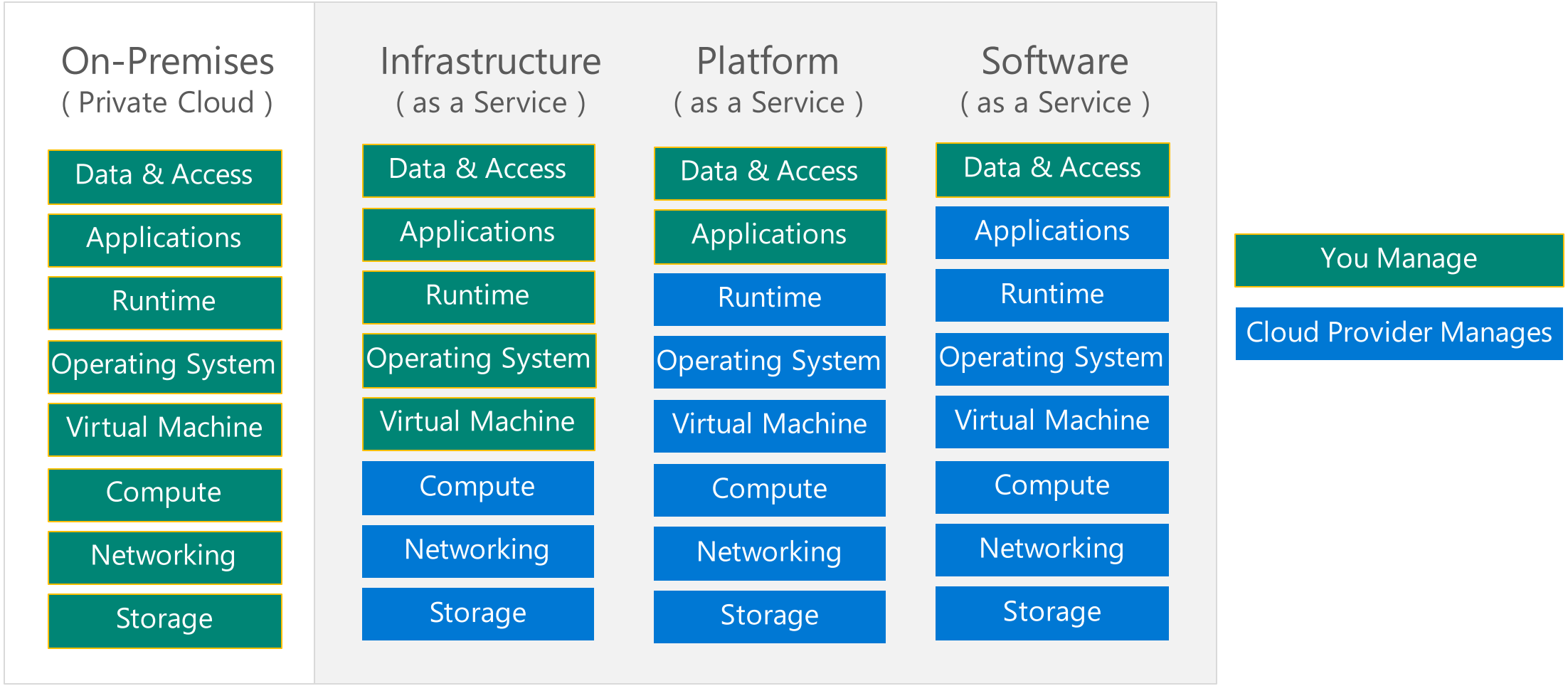
Users connect to and use cloud-based apps over the internet: for example, Microsoft Office 365, email, and calendars



Cloud service comparison

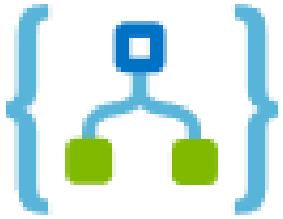
IaaS	PaaS	SaaS
The most flexible cloud service.	Focus on application development.	Pay-as-you-go pricing model.
You configure and manage the hardware for your application.	Platform management is handled by the cloud provider.	Users pay for the software they use on a subscription model.

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**.**



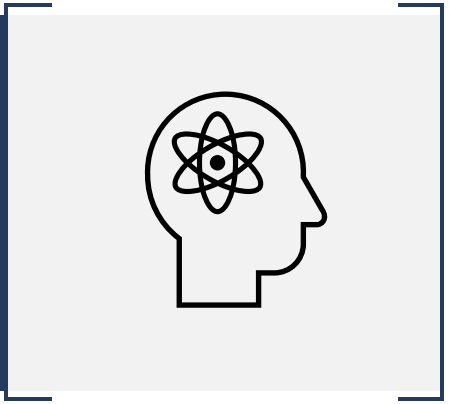
Azure Logic Apps is a cloud service that helps you automate and orchestrate tasks, business processes, and workflows when you need to integrate apps, data, systems, and services.

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

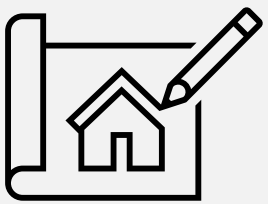


Module 02 – Outline

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



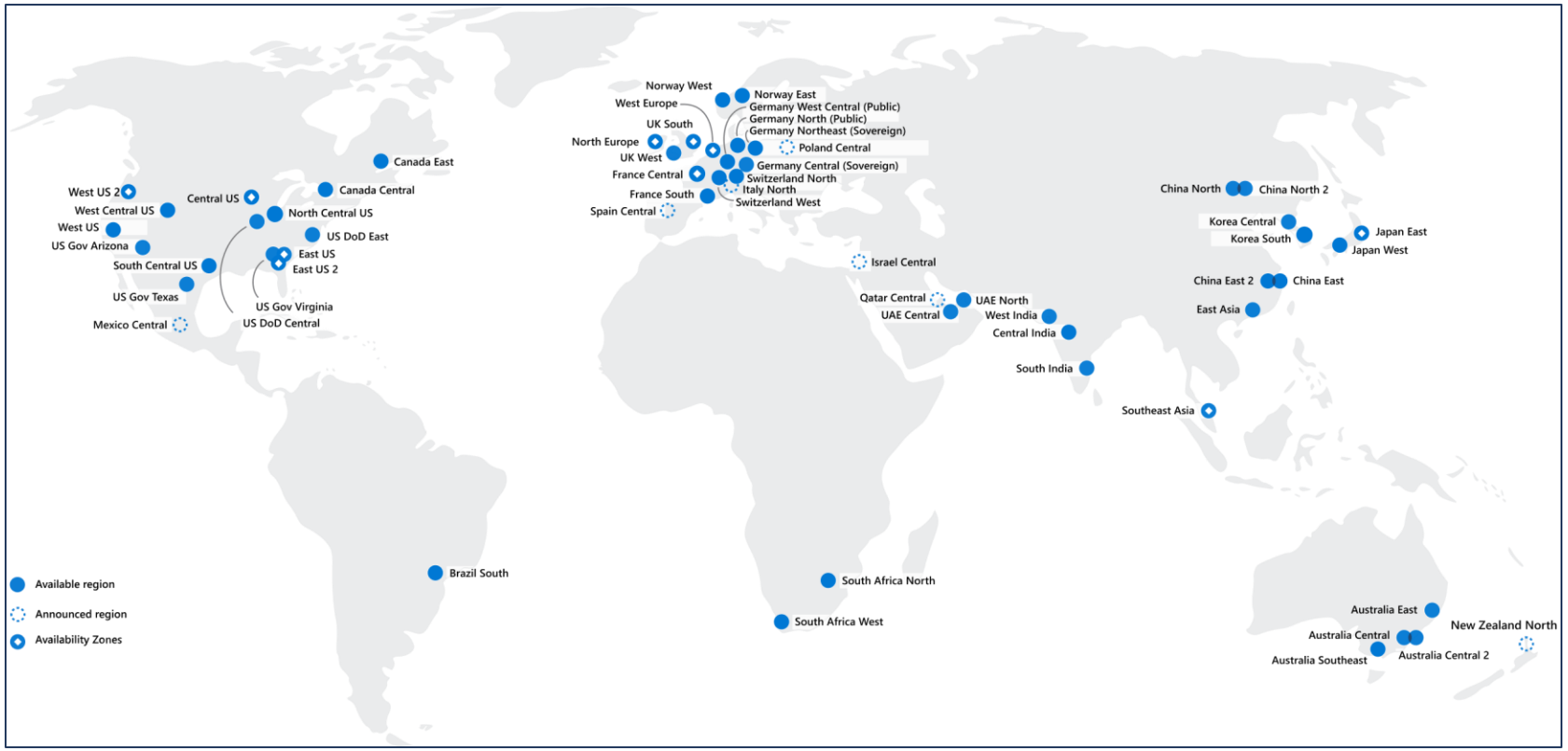
Core Azure architectural components – Objective Domain

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

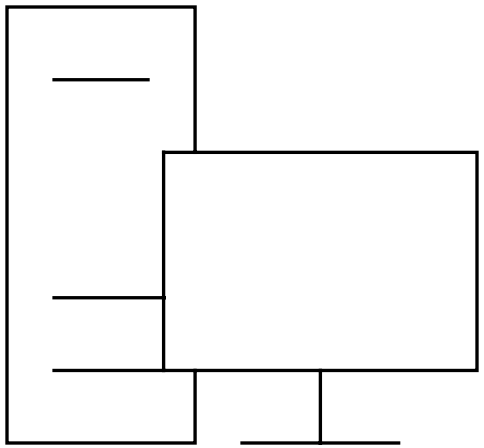
- At least 300 miles of separation between region pairs.
- Automatic replication for some services.
- Prioritized region recovery in the event of outage.
- Updates are rollout sequentially to minimize downtime.

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

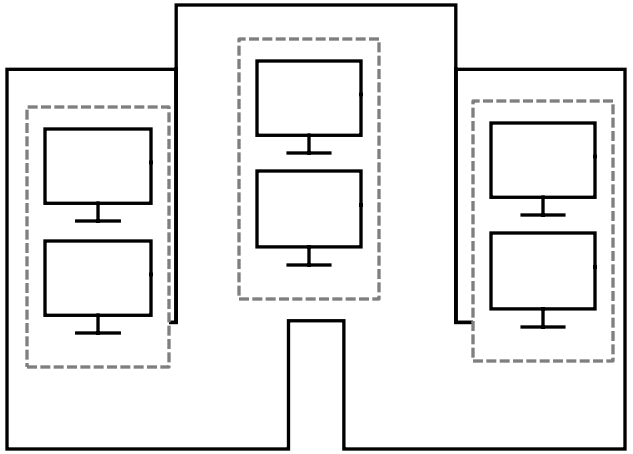
Availability Options

VM SLA
99.9% with Premium Storage



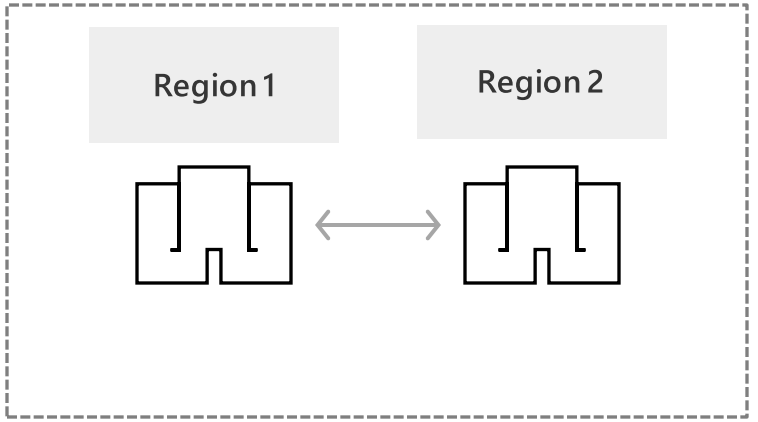
SINGLE VM
Easier lift and shift

VM SLA
99.99%



AVAILABILITY ZONES
Protection from entire datacenter failures

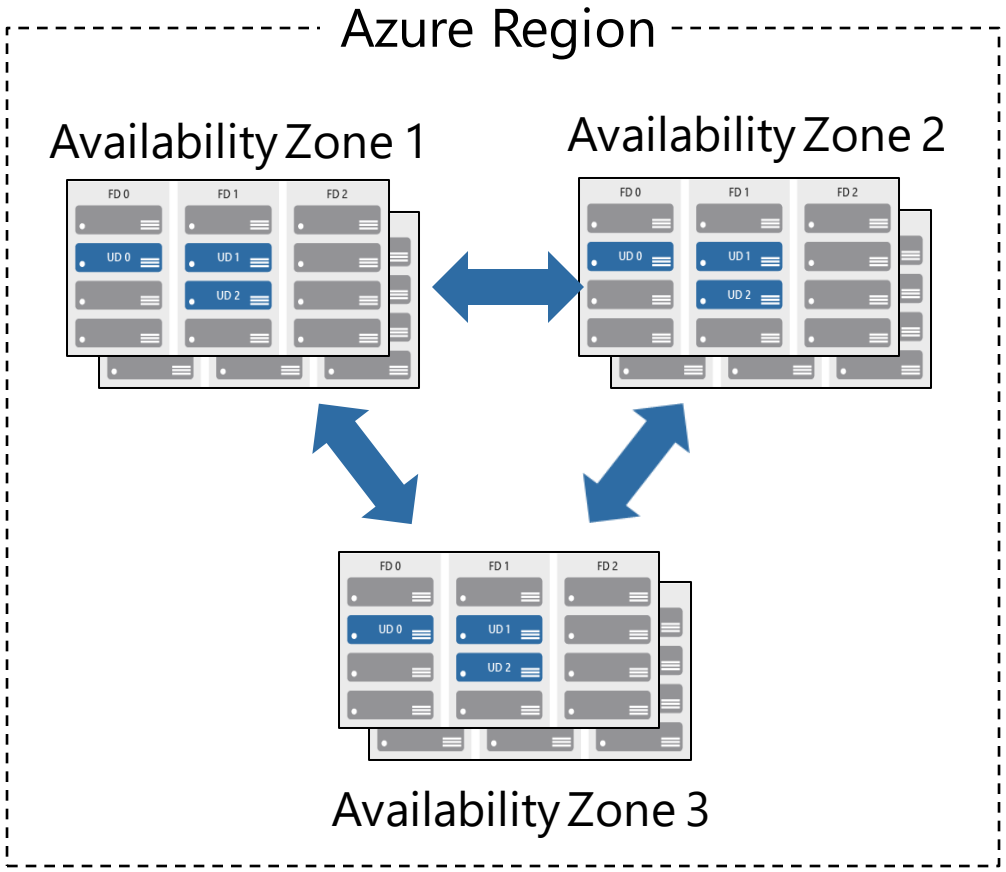
MULTI-REGION DISASTER RECOVERY



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

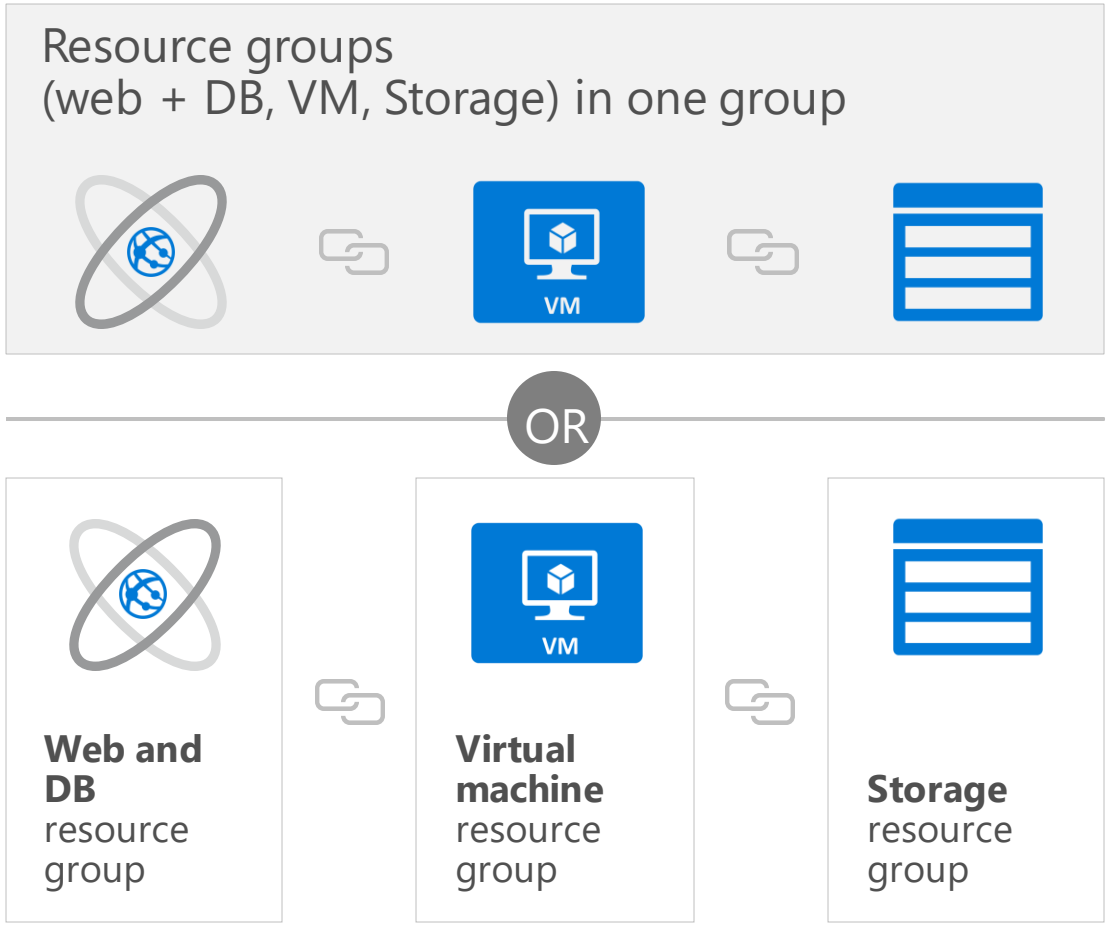
SQL Databases

Functions

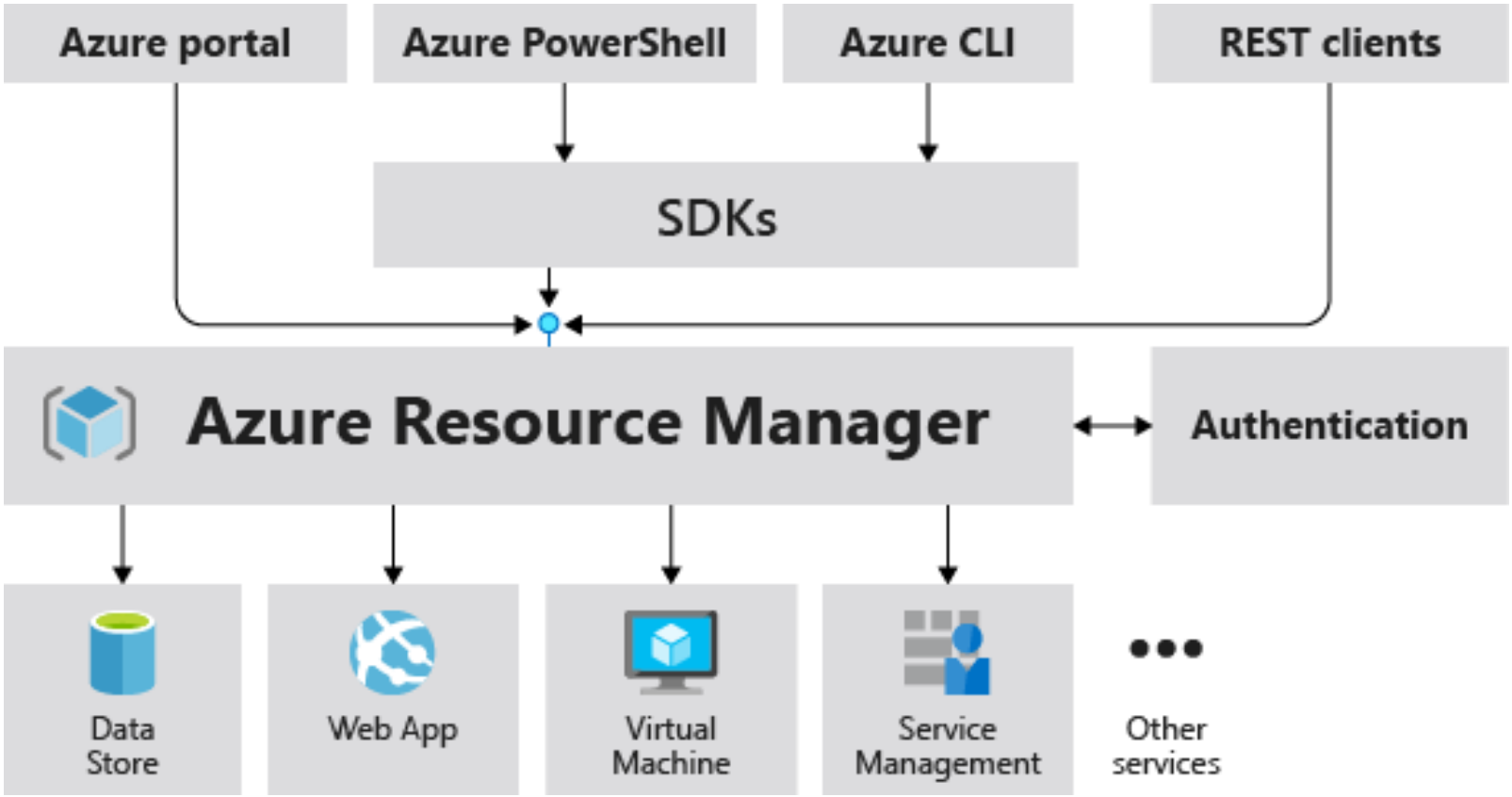
Resource groups

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

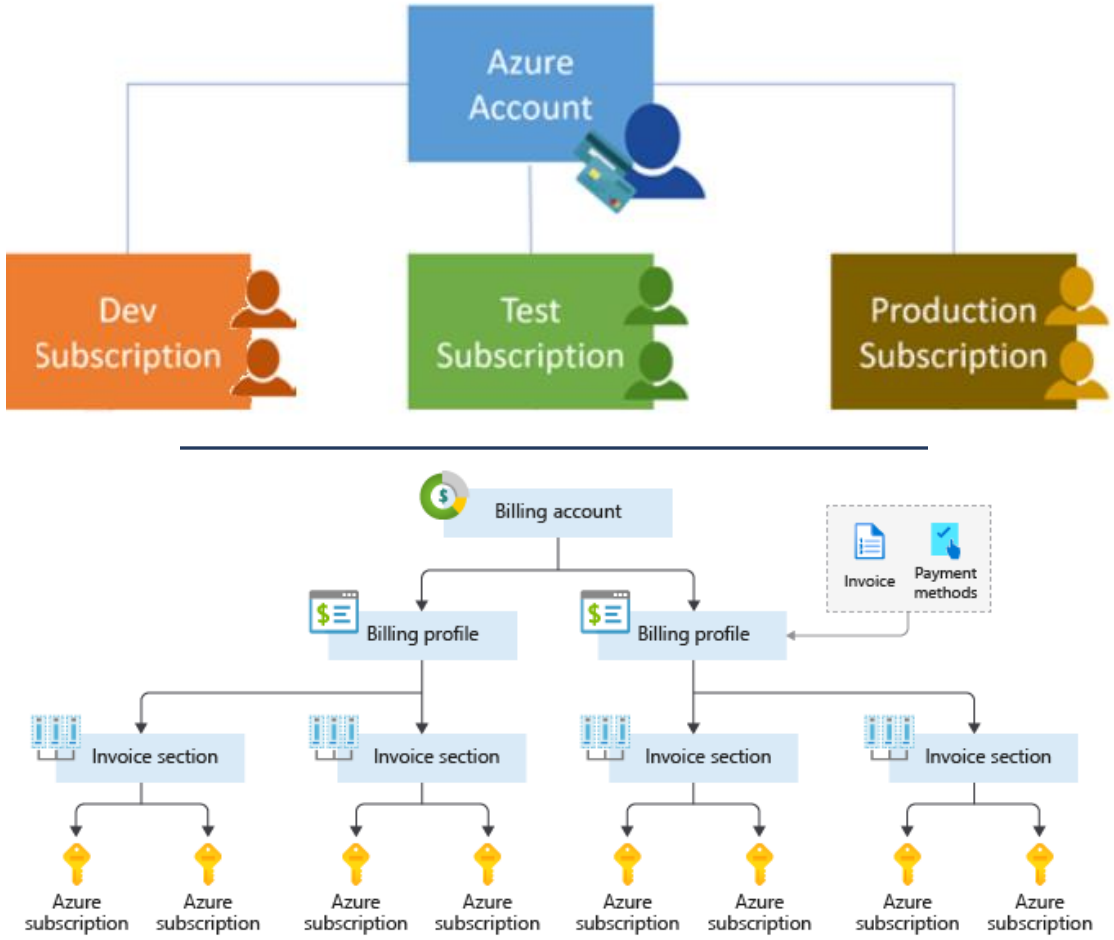


The **Azure Resource Manager (ARM)** provides a management layer that enables you to create, update, and delete resources in your Azure subscription.

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.



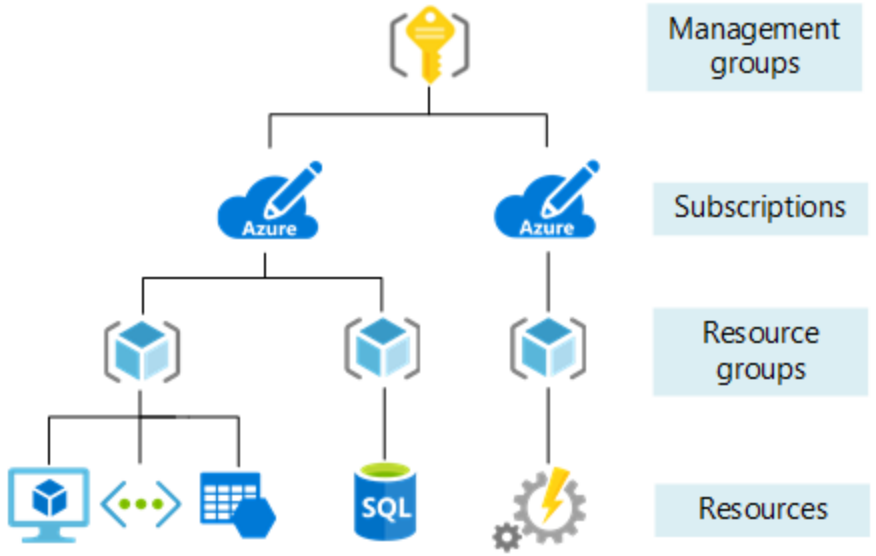
Walkthrough – Explore the Azure Portal

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

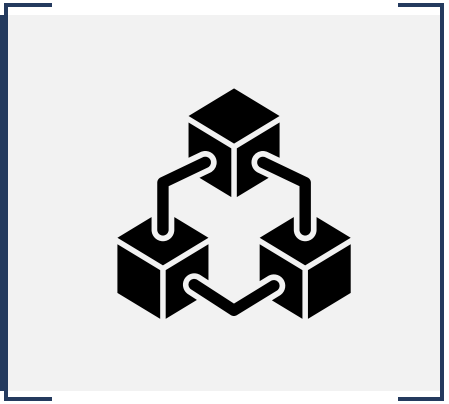
1. Connect to https://portal.azure.com
2. Explore the home screen.
3. Find “All Services” and see what is available.

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

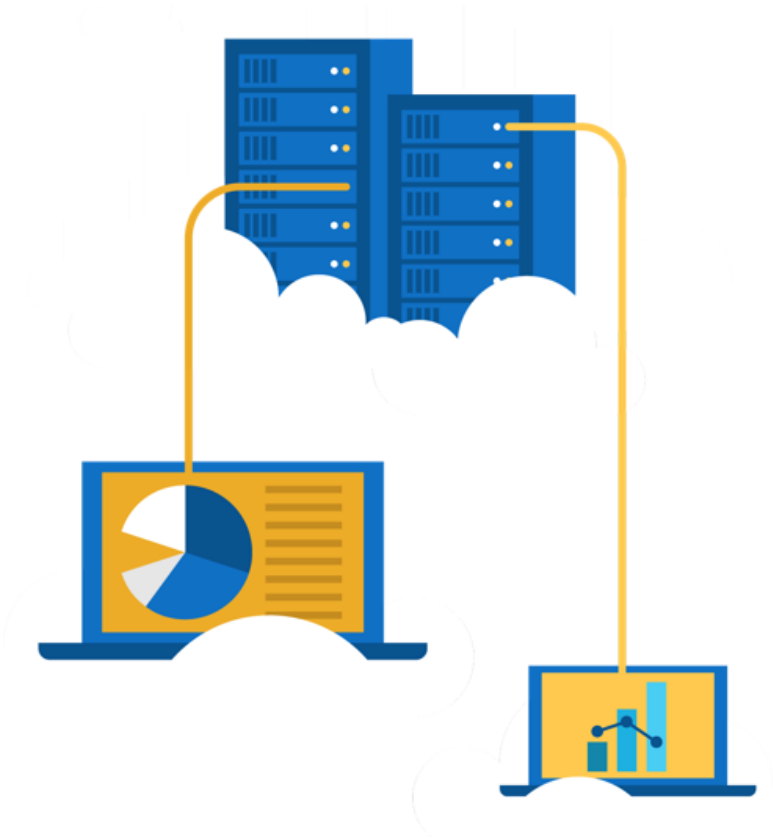
Azure **Virtual Machines (VM)** are software emulations of physical computers.

- 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

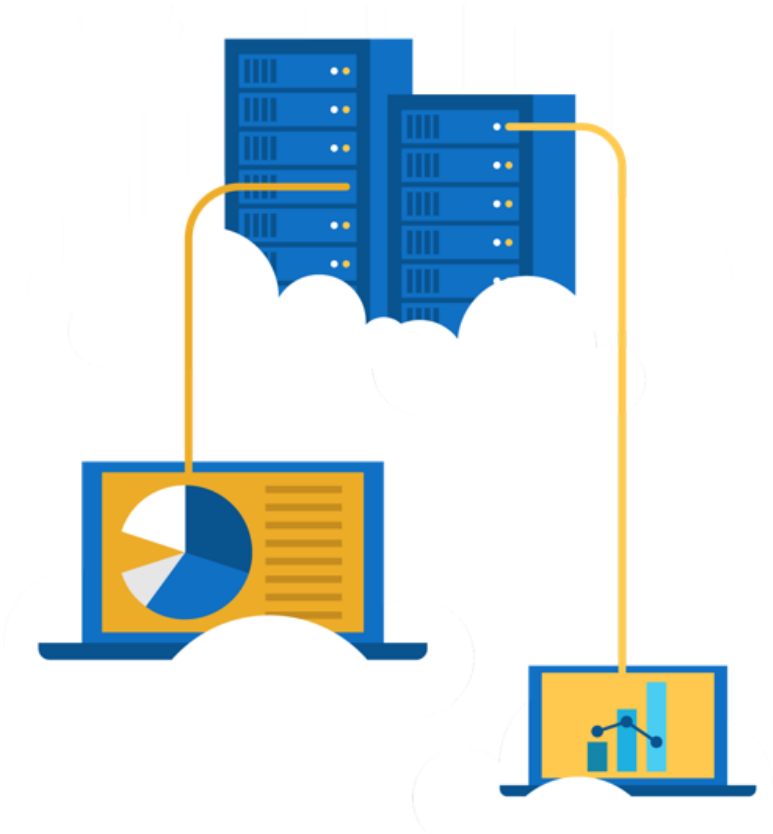
Azure **App Services** is a fully managed platform to build, deploy, and scale web apps and APIs quickly.

- 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.

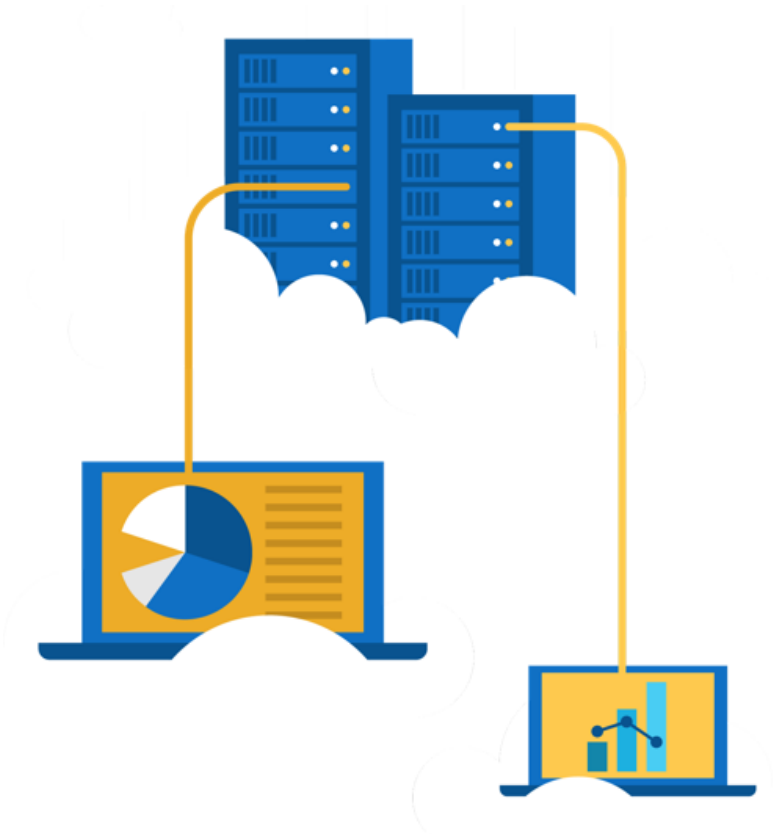
Azure Container Instances: a PaaS offering that runs a container in Azure without the need to manage a virtual machine or additional services.

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.

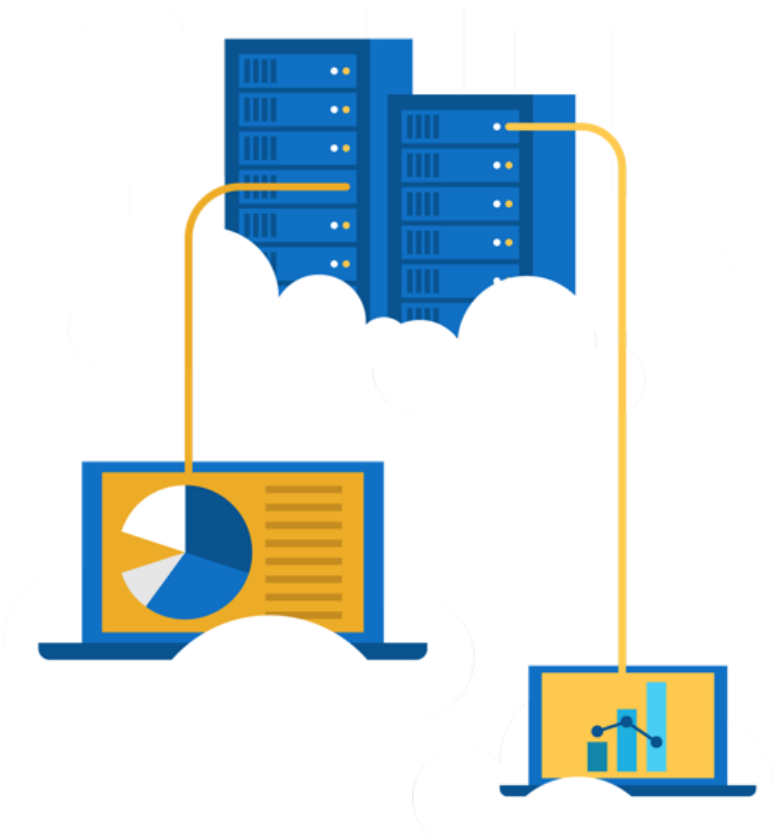
Virtual Private Network Gateway (VPN) is used to send encrypted traffic between an Azure virtual network and an on-premises location over the public internet.

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.



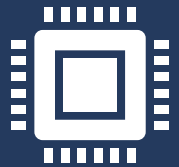
Azure storage services

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

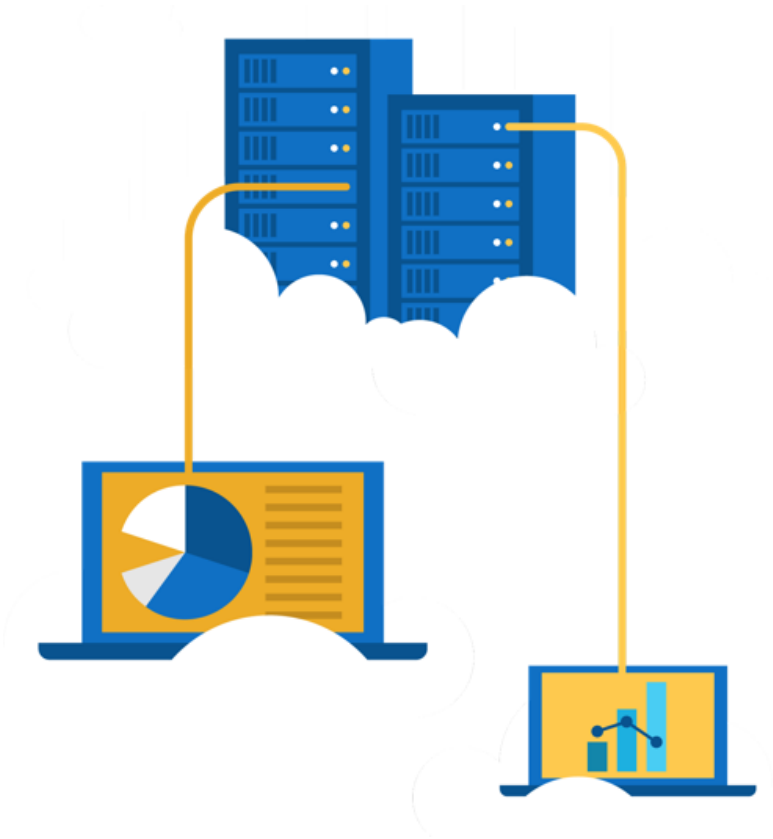
 Hot	 Cool	 Archive
Optimized for storing data that is accessed frequently.	Optimized for storing data that is infrequently accessed and stored for at least 30 days.	Optimized for storing data that is rarely accessed and stored for at least 180 days with flexible latency requirements.

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

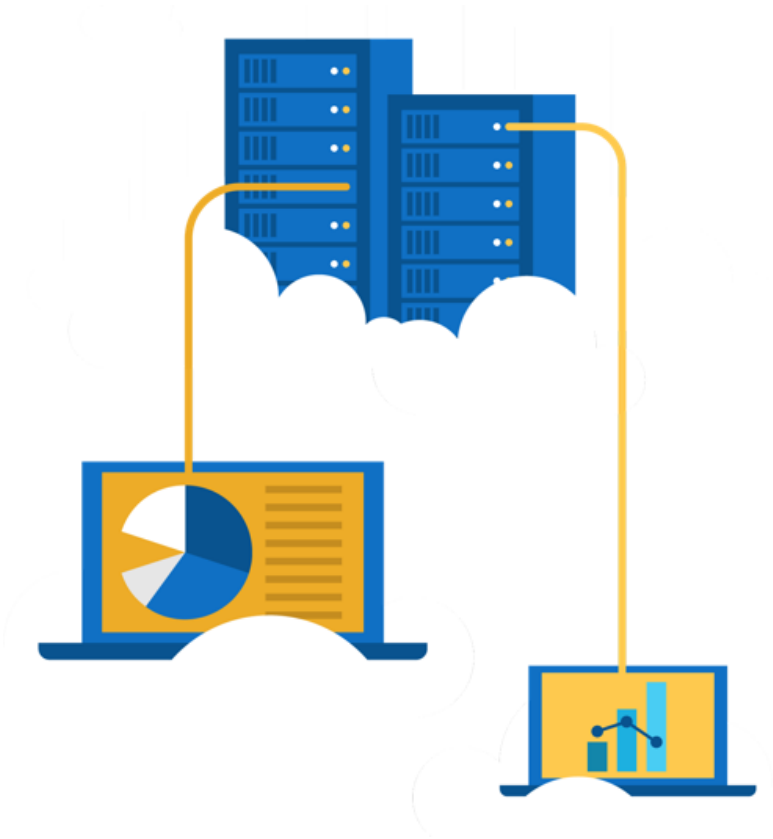
Azure SQL Managed Instance allows existing SQL Server customers to lift and shift their on-premises applications to the cloud with minimal application and database changes.

- 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

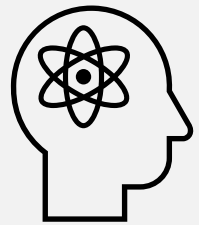
Microsoft Learn Modules
(docs.microsoft.com/Learn)

- 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

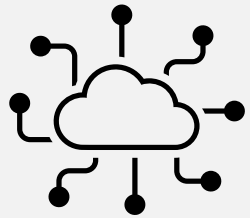


Module 03 – Outline

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.

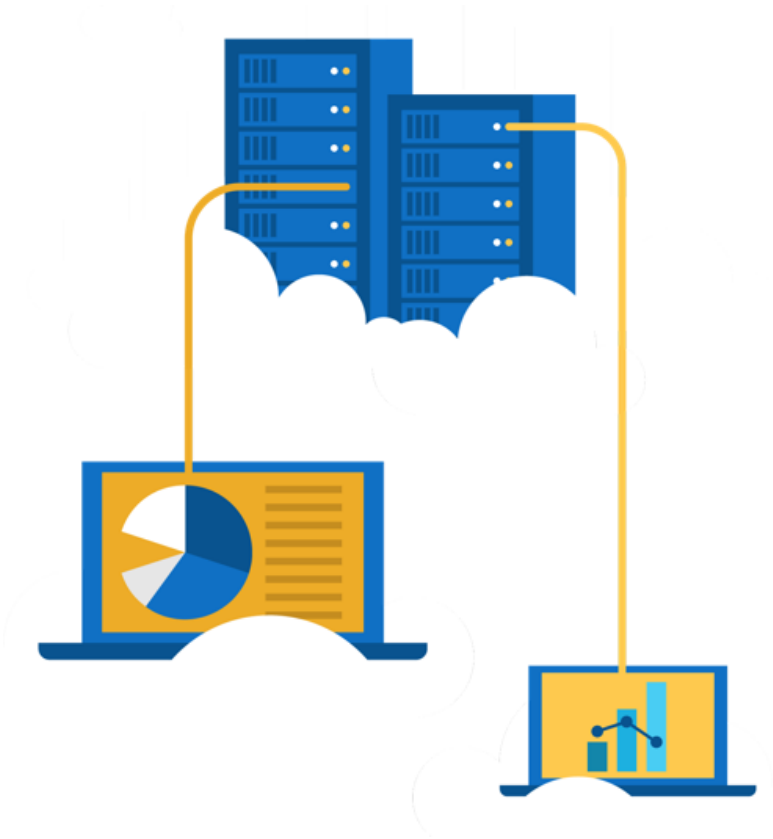
Azure IoT Hub is a managed service hosted in the cloud that acts as a central message hub for bi-directional communication between IoT applications and the devices it manages.

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.

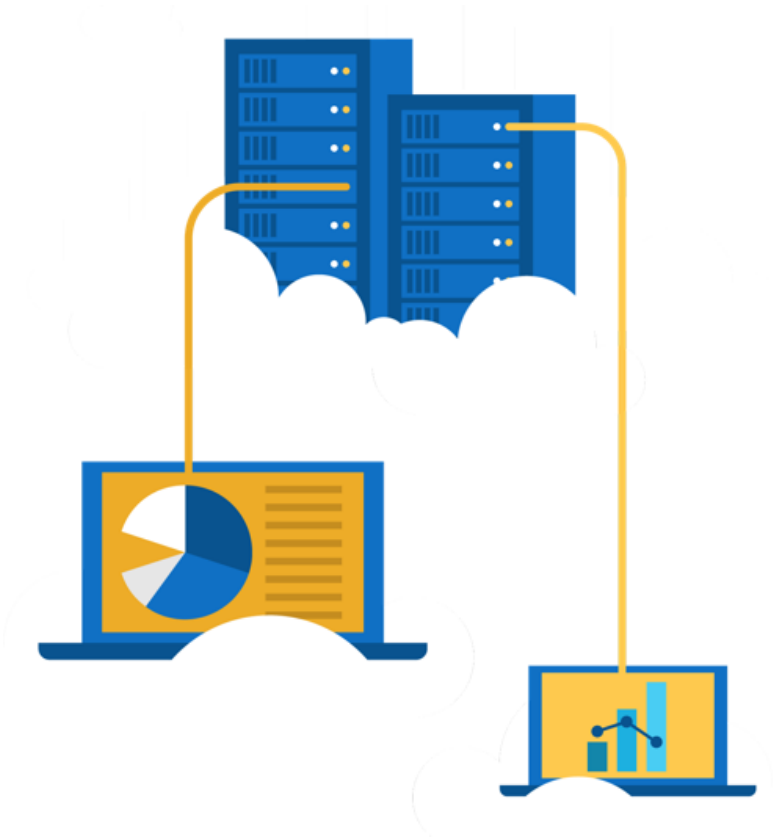
Azure Logic Apps

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.

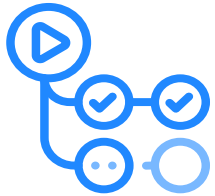
1. Create a Function app.
2. Create a HTTP triggered event function and test.



Develop your apps with DevOps and GitHub

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

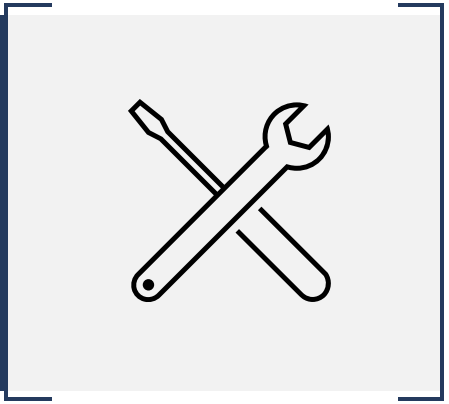
GitHub: software development hosting with version control, source code management, and bug/task management.



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

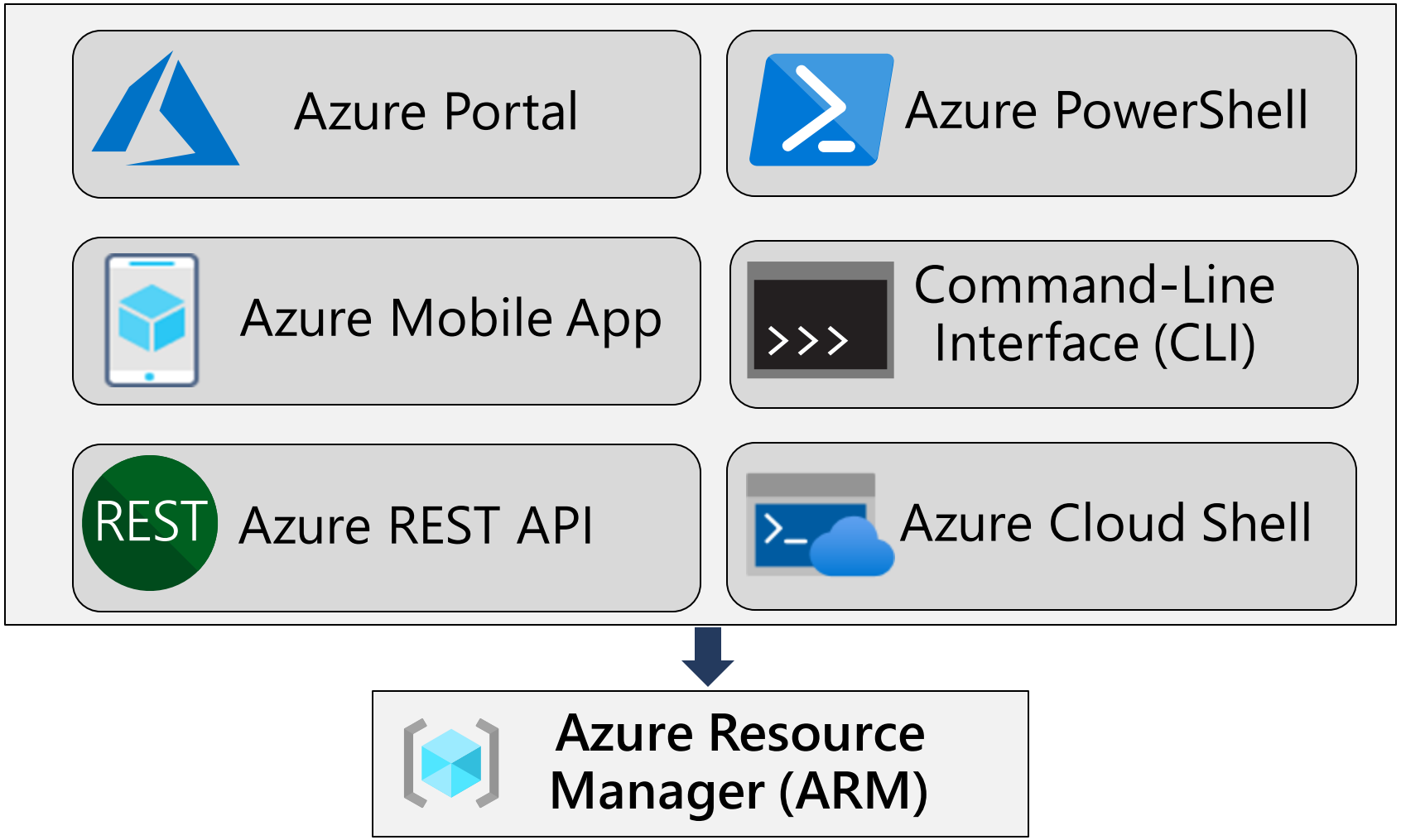


Azure Management Tools - Objective Domain

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.

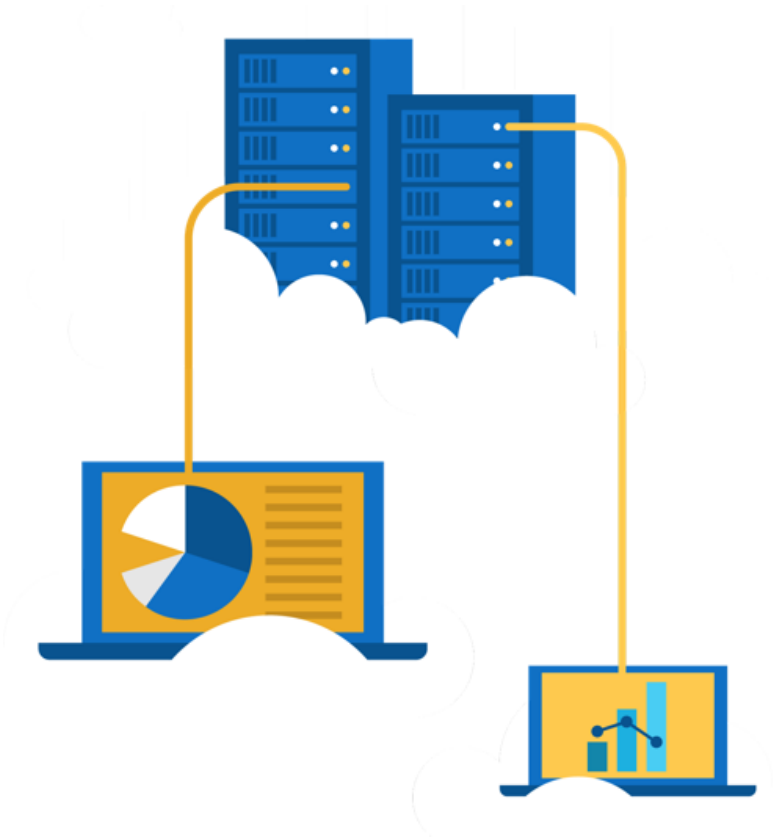
Azure management tools



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.

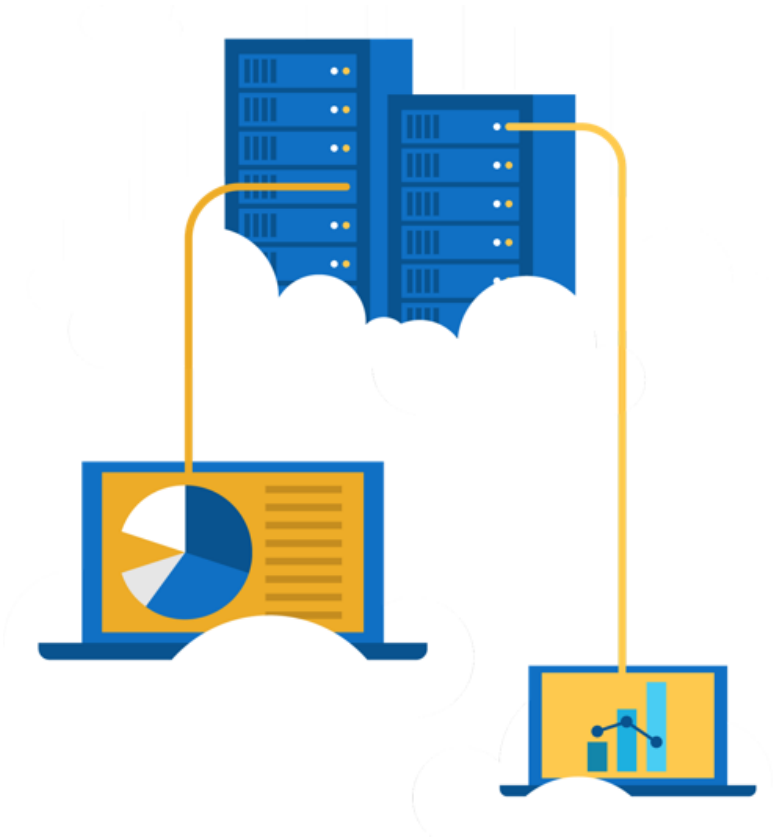


Walkthrough - Create a VM with PowerShell

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.

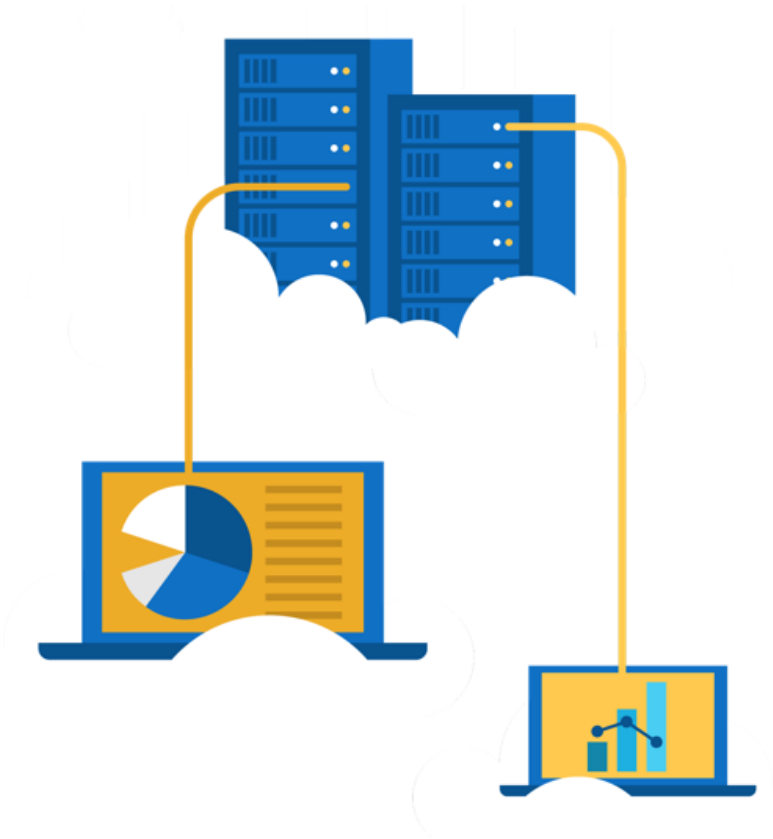
1. Execute PowerShell commands in the Cloud Shell.
2. Review Azure Advisor Recommendations.



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.

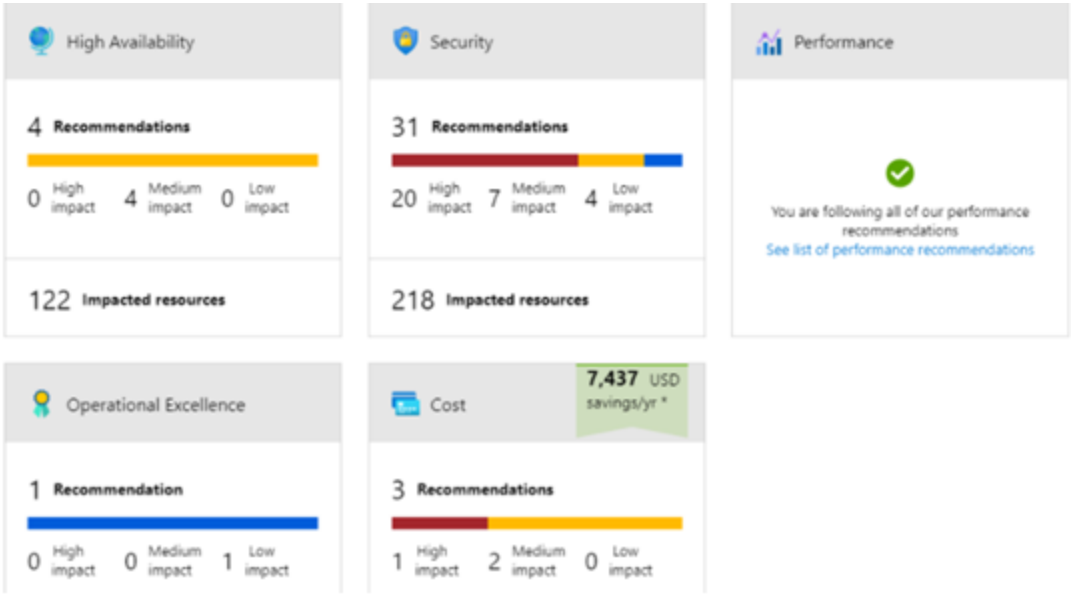
1. Install the CLI locally.
2. Use the CLI to create a resource group and virtual machine.
3. Execute commands in the Cloud Shell.
4. Review Azure Advisor Recommendations.



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

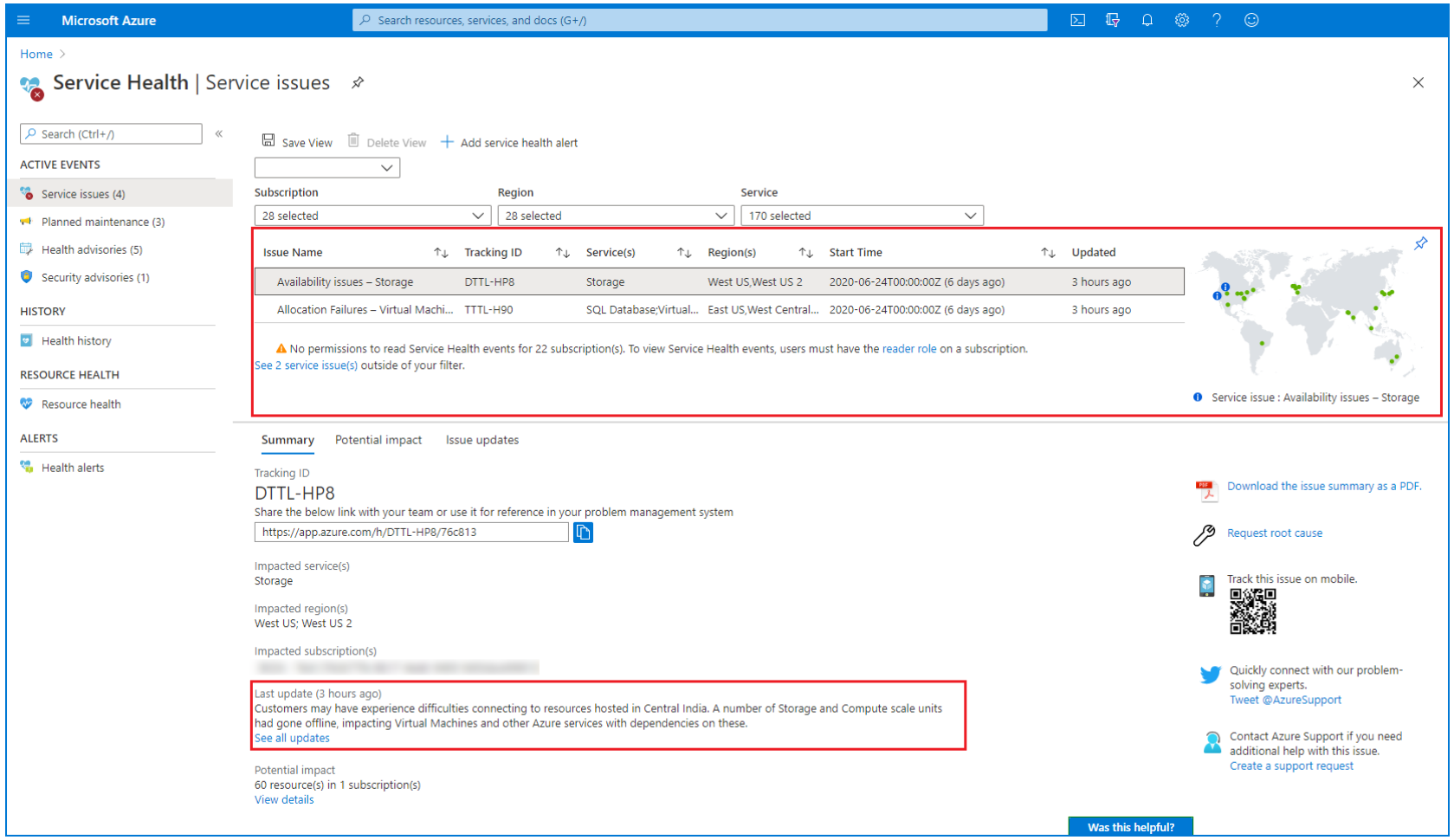


Azure Monitor

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.

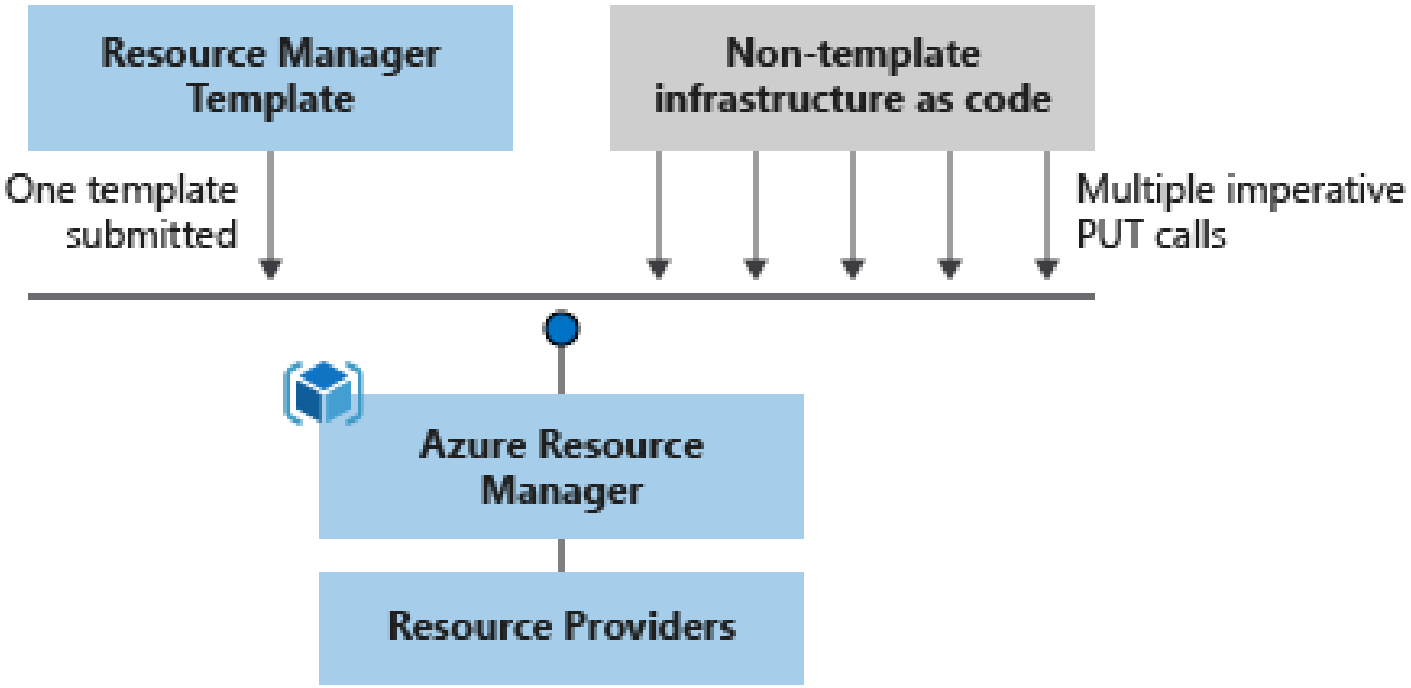
- Communication regarding outages
- Planned maintenance
- Other health advisories

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

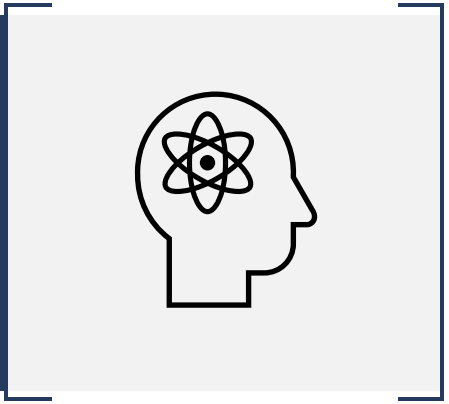
Microsoft Learn Modules
(docs.microsoft.com/Learn)

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

Microsoft

MOD 4: Azure Security and Network Security

Module outline



Module 04 – Outline

You will learn the following concepts:

- **Azure Security features**
  - Security Center and resource hygiene
  - Key Vault, Sentinel, and Dedicated Hosts
- **Azure network security**
  - Defense in depth
  - Network Security Groups and Firewalls
  - DDoS protection

Security tools and features

Security tools and features - Objective Domain

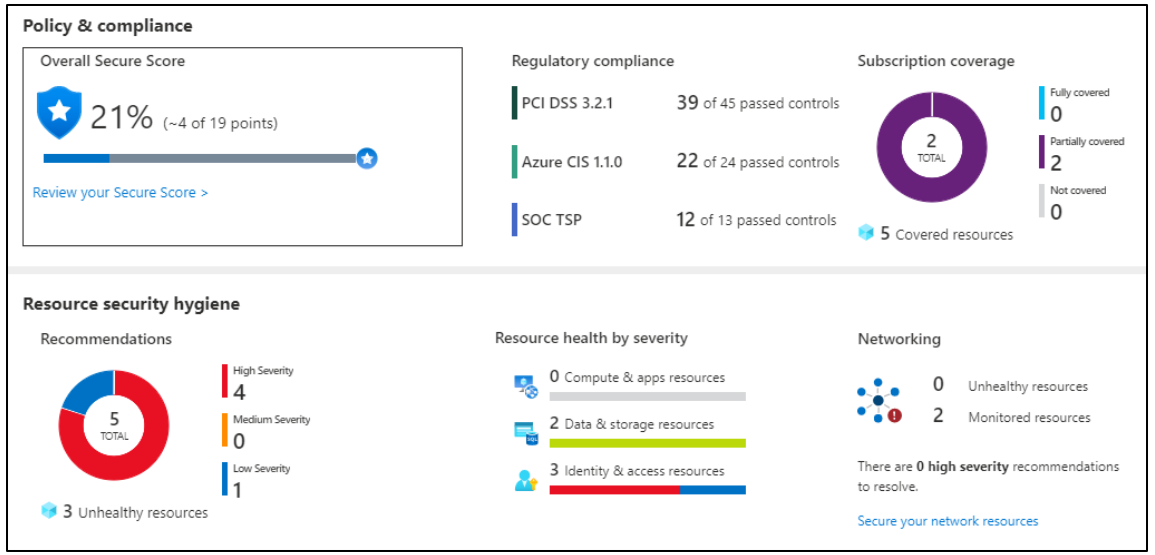
Describe the features and the functionality of:

- Azure Security Center, including policy compliance, security alerts, secure score, and resource hygiene
- Azure Sentinel
- Key Vault
- Azure Dedicated Hosts

Azure Security Center

Azure Security Center is a monitoring service that provides threat protection across both Azure and on-premises datacenters.

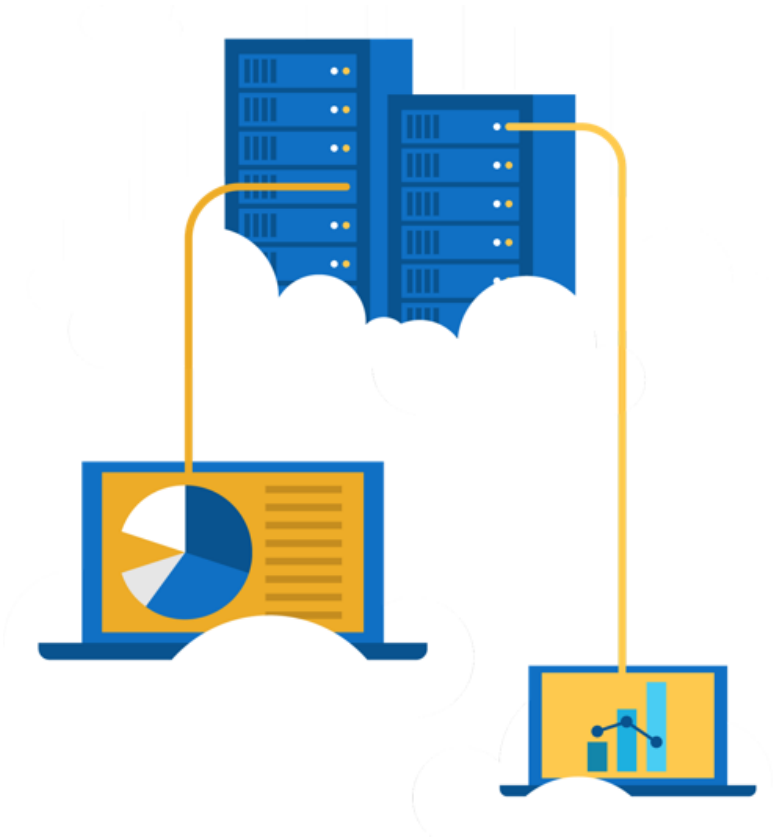
- Provides security recommendations
- Detect and block malware
- Analyze and identify potential attacks
- Just-in-time access control for ports



Walkthrough-Azure Security Center

Open Azure Security Center and view some of the common features and configuration options.

1. Launch Azure Security Center.
2. View Policy compliance options.
3. Review your Secure Score.
4. Set a Security Alert.
5. Explore Resource Hygiene.



Azure Security Center - capabilities

Policy Compliance

Run policies across management groups, subscriptions, or tenants.

Continuous Assessments

Assess new and deployed resources to ensure that they are configure properly.

Tailored Recommendations

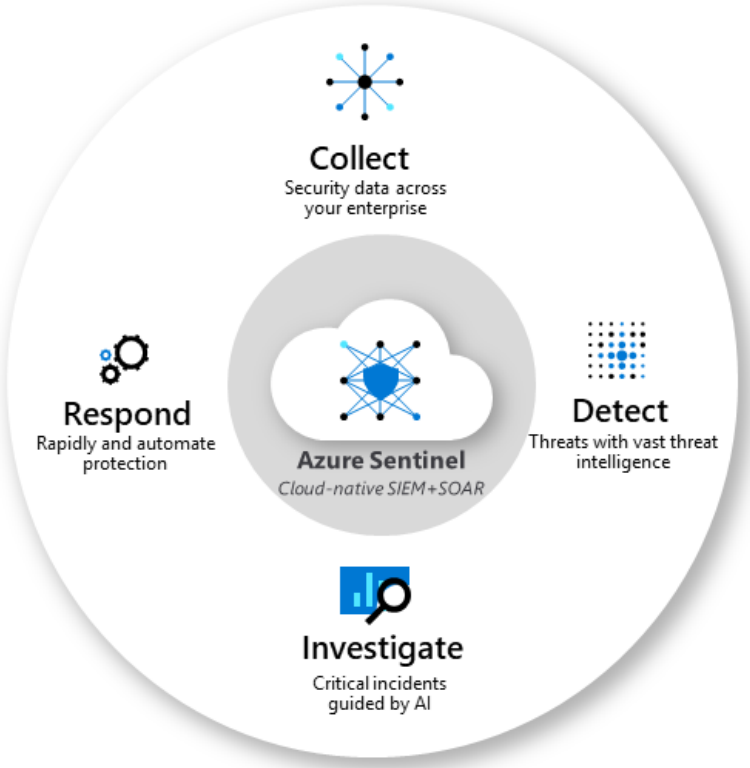
Recommendations based on existing workload with instructions on how to implement them.

Threat Protection

Analyze attempted threats through alerts and impacted resource reports.

Azure Sentinel

Azure Sentinel is a security information management (SIEM) and security automated response (SOAR) solution that provides security analytics and threat intelligence across an enterprise.



Connector and Integrations:

- Office 365
- Azure Active Director
- Azure Advanced Threat Protection
- Microsoft Cloud App Security

Azure Key Vault

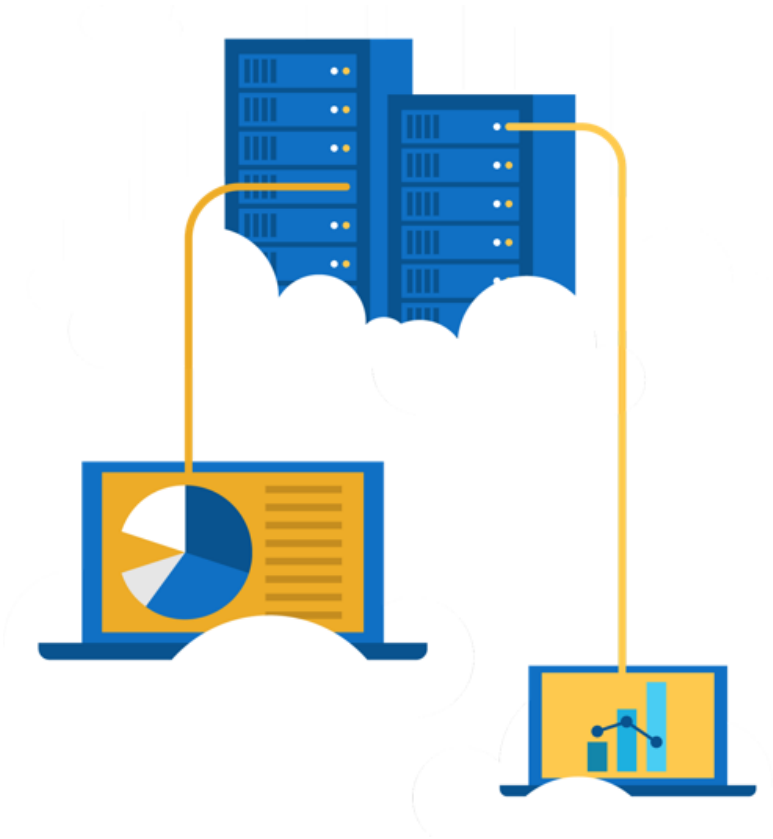
Azure Key Vault stores application secrets in a centralized cloud location in order to securely control access permissions and access logging.

- Secrets management.
- Key management.
- Certificate management.
- Storing secrets backed by hardware security modules (HSMs).

Walkthrough-Implement Azure Key Vault

Create an Azure Key vault and then create a password secret within the key vault.

1. Create an Azure key vault.
2. Add a secret to the Azure key vault.



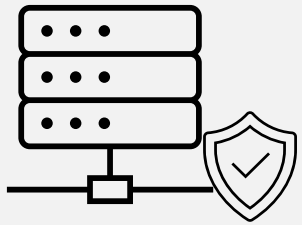
Azure Dedicated Host

Azure Dedicated Host provides physical servers that host one or more Azure virtual machines that is dedicated to a single organization's workload.

Benefits

- Hardware isolation at the server level
- Control over maintenance event timing
- Aligned with Azure Hybrid Use Benefits

Secure network connectivity



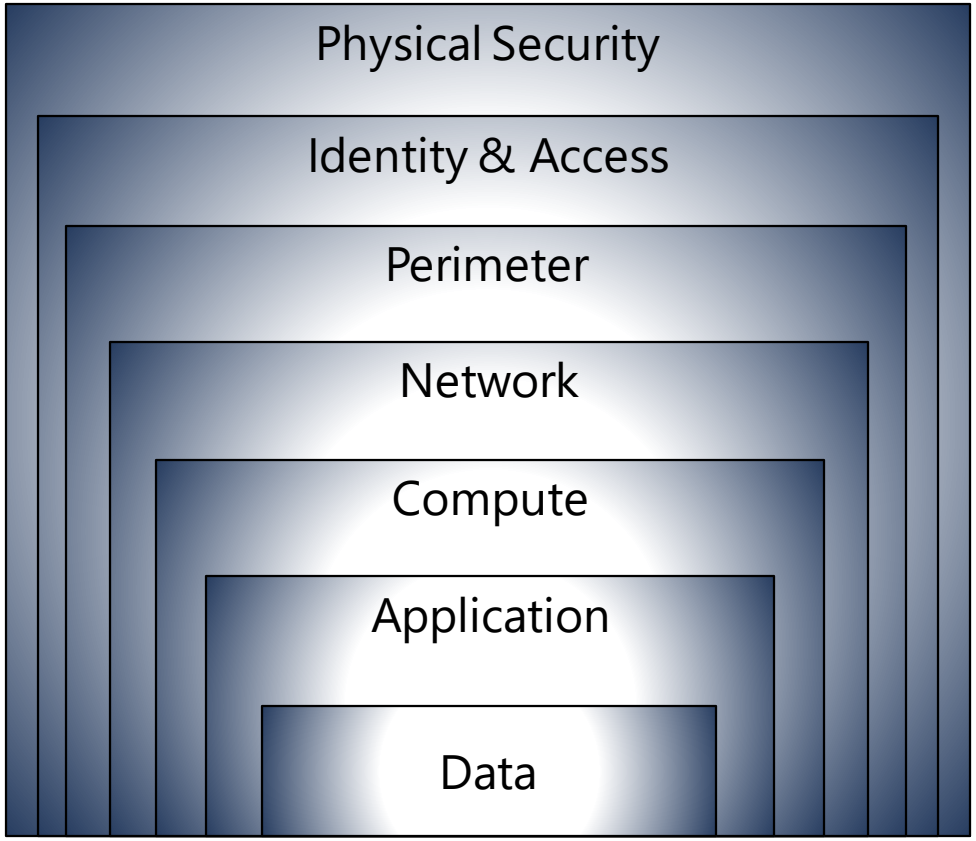
Secure Network Connectivity - Objective Domain

Describe the concept and functionality of:

- Defense in depth
- Network Security Groups (NSG)
- Azure Firewall
- Azure DDoS protection

Defense in depth

- A layered approach to securing computer systems.
- Provides multiple levels of protection.
- Attacks against one layer are isolated from subsequent layers.



Shared Security

- Migrating from customer-controlled to cloud-based datacenters shifts the responsibility for security.
- Security becomes a shared concern between cloud providers and customers.

Responsibility	On-Premises	IaaS	PaaS	SaaS
Data governance and Rights Management	Customer	Customer	Customer	Customer
Client endpoints	Customer	Customer	Customer	Customer
Account and access management	Customer	Customer	Customer	Customer
Identity and directory infrastructure	Customer	Customer	Microsoft/ Customer	Microsoft/ Customer
Application	Customer	Customer	Microsoft/ Customer	Microsoft
Network controls	Customer	Customer	Microsoft/ Customer	Microsoft
Operating system	Customer	Customer	Microsoft	Microsoft
Physical hosts	Customer	Microsoft	Microsoft	Microsoft
Physical network	Customer	Microsoft	Microsoft	Microsoft
Physical datacenter	Customer	Microsoft	Microsoft	Microsoft

Network Security Groups (NSGs)

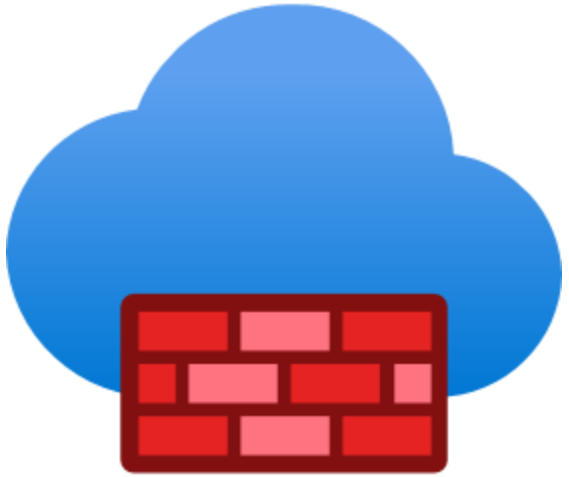
Network Security Groups (NSGs) filter network traffic to and from Azure resources on Azure Virtual Networks.

- Set inbound and outbound rules to filter by source and destination IP address, port, and protocol.
- Add multiple rules, as needed, within subscription limits.
- Azure applies default, baseline security rules to new NSGs.
- Override default rules with new, higher priority rules.

Azure Firewall

A stateful, managed Firewall as a Service (FaaS) that grants/denies server access based on originating IP address, in order to protect network resources.

- Applies inbound and outbound traffic filtering rules
- Built-in high availability
- Unrestricted cloud scalability
- Uses Azure Monitor logging



Azure Application Gateway also provides a firewall, Web Application Firewall (WAF). WAF provides centralized, inbound protection for your web applications.

Azure Distributed Denial of Service (DDoS) protection

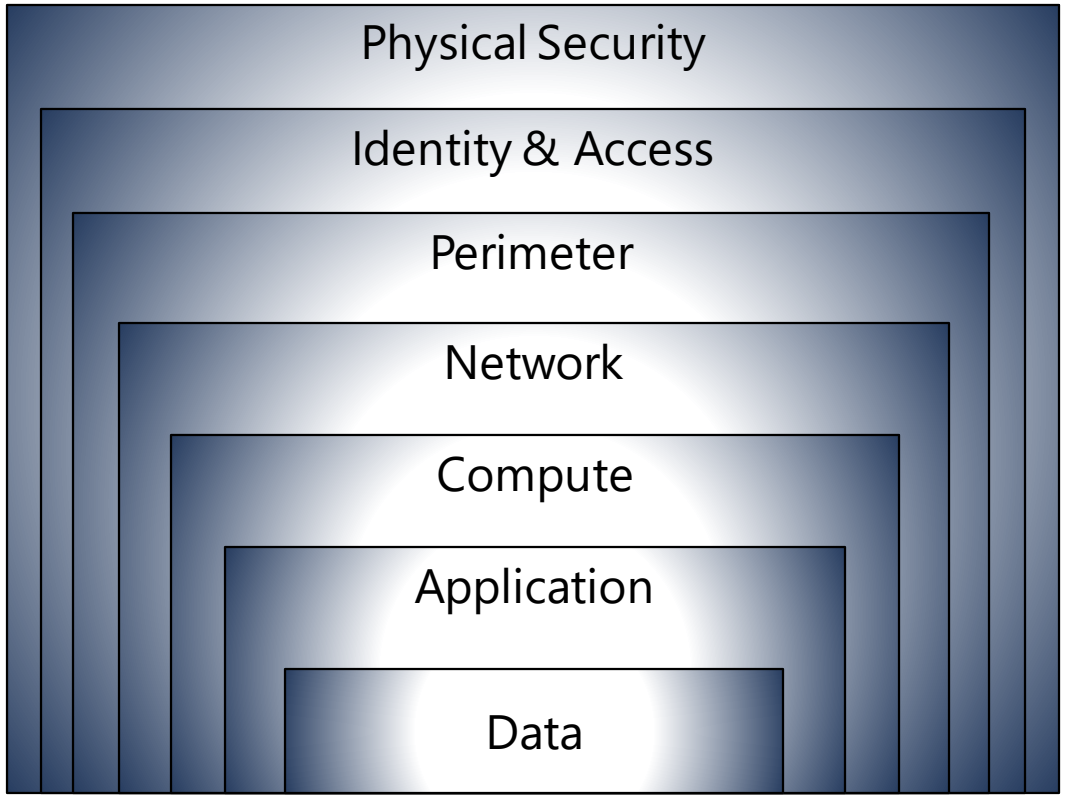
DDoS attacks overwhelm and exhaust network resources, making apps slow or unresponsive.

- Sanitizes unwanted network traffic before it impacts service availability.
- Basic service tier is automatically enabled in Azure.
- Standard service tier adds mitigation capabilities that are tuned to protect Azure Virtual Network resources.

Defense in Depth Reviewed

Combining network security solutions

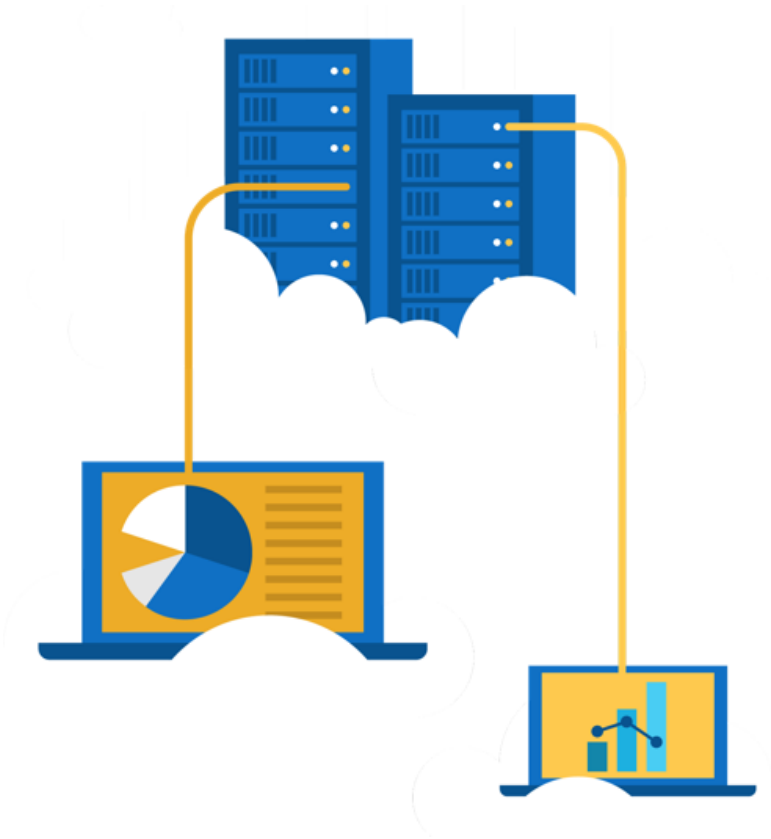
- **NSGs** with **Azure Firewall** to achieve defense in depth.
- **Perimeter layer** protects your network boundaries with Azure DDoS Protection and Azure Firewall.
- **Networking layer** only permits traffic to pass between networked resources with Network Security Group (NSG) inbound and outbound rules.



Walkthrough - Secure network traffic

Create and configure inbound & outbound security port rules.

1. Deploy a custom template to create a virtual machine.
2. Create a network security group.
3. Create an inbound security port rule to allow RDP.
4. Configure an outbound security port rule to deny Internet access.



Module 4 Review

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

- Azure Security Center and resource hygiene
- Key Vault, Sentinel, and Dedicated Hosts
- Defense in depth
- DDoS protection

Microsoft

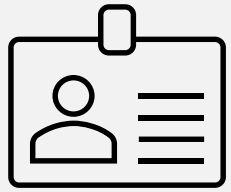
MOD 5: Identity, governance, privacy and compliance

Module 05 – Outline

You will learn the following concepts:

- **Azure identity services**
  - Authentication versus Authorization
  - Azure AD, MFA, SSO and Conditional Access
- **Azure governance features**
  - RBAC
  - Resource locks and tags
  - Policy, Blueprints, and CAF
- **Azure privacy and compliance**
  - Privacy statement and Online Services Terms
  - Trust Center and compliance documentation
  - Azure Sovereign Regions

Core Azure identity services



Azure Identity Services - Objective Domain

- Explain the difference between authentication and authorization
- Define Azure Active Directory
- Describe the functionality and usage of Azure Active Directory
- Describe the functionality and usage of Conditional Access, Multi-Factor Authentication (MFA), and Single Sign-On (SSO)

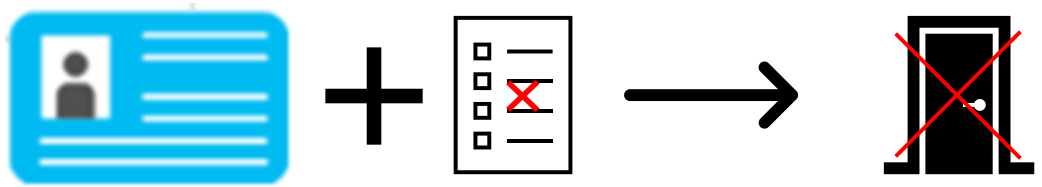
Compare Authentication and Authorization

Authentication

- Identifies the person or service seeking access to a resource.
- Requests legitimate access credentials.
- Basis for creating secure identity and access control principles.

Authorization

- Determines an authenticated person's or service's level of access.
- Defines which data they can access, and what they can do with it.



Azure Multi-Factor Authentication

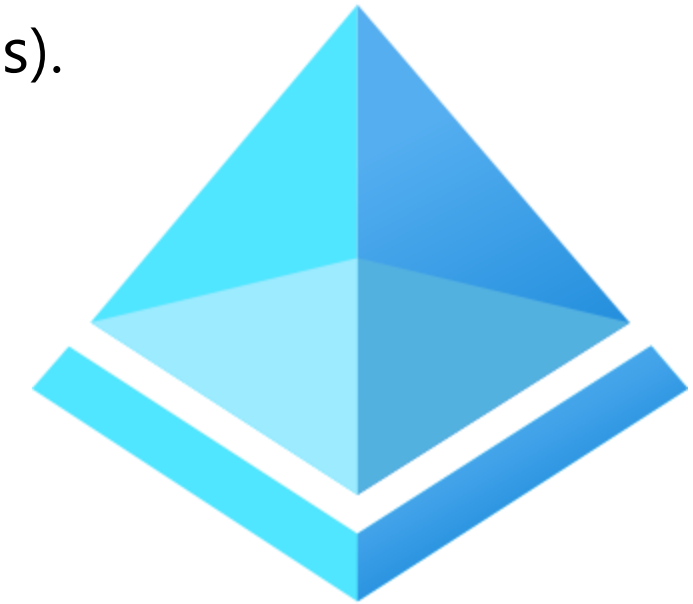
Provides additional security for your identities by requiring two or more elements for full authentication.

- Something you know.
- Something you possess.
- Something you are.

Azure Active Directory (AAD)

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

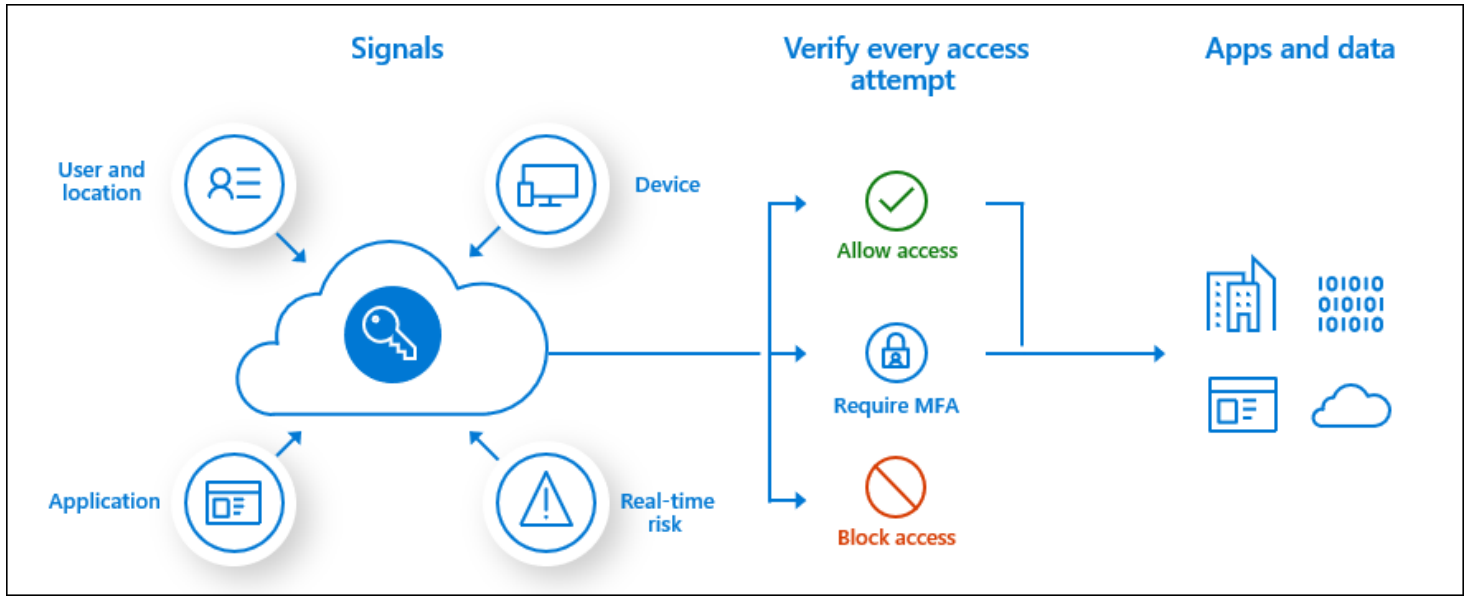
- Authentication (employees sign-in to access resources).
- Single sign-on (SSO).
- Application management.
- Business to Business (B2B).
- Business to Customer (B2C) identity services.
- Device management.



Conditional Access

Conditional Access is used by Azure Active Directory to bring signals together, to make decisions, and enforce organizational policies.

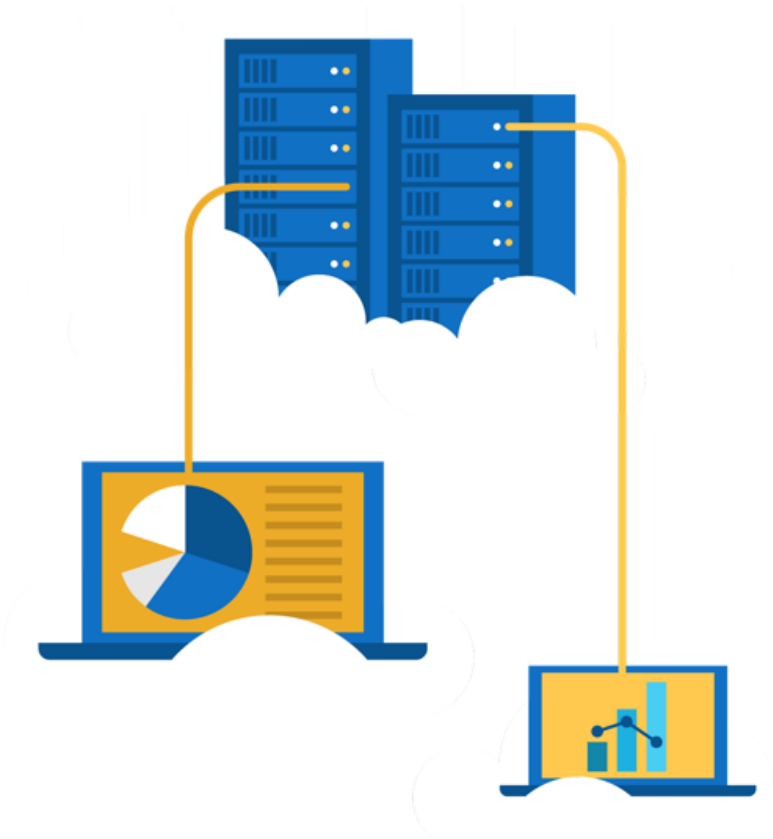
- User or Group Membership
- IP Location
- Device
- Application
- Risk Detection



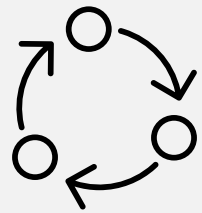
Walkthrough - Manage access with RBAC

Assign roles and view activity logs.

1. View and assign roles.
2. View the activity log and remove a role assignment.



Azure Governance Methodologies

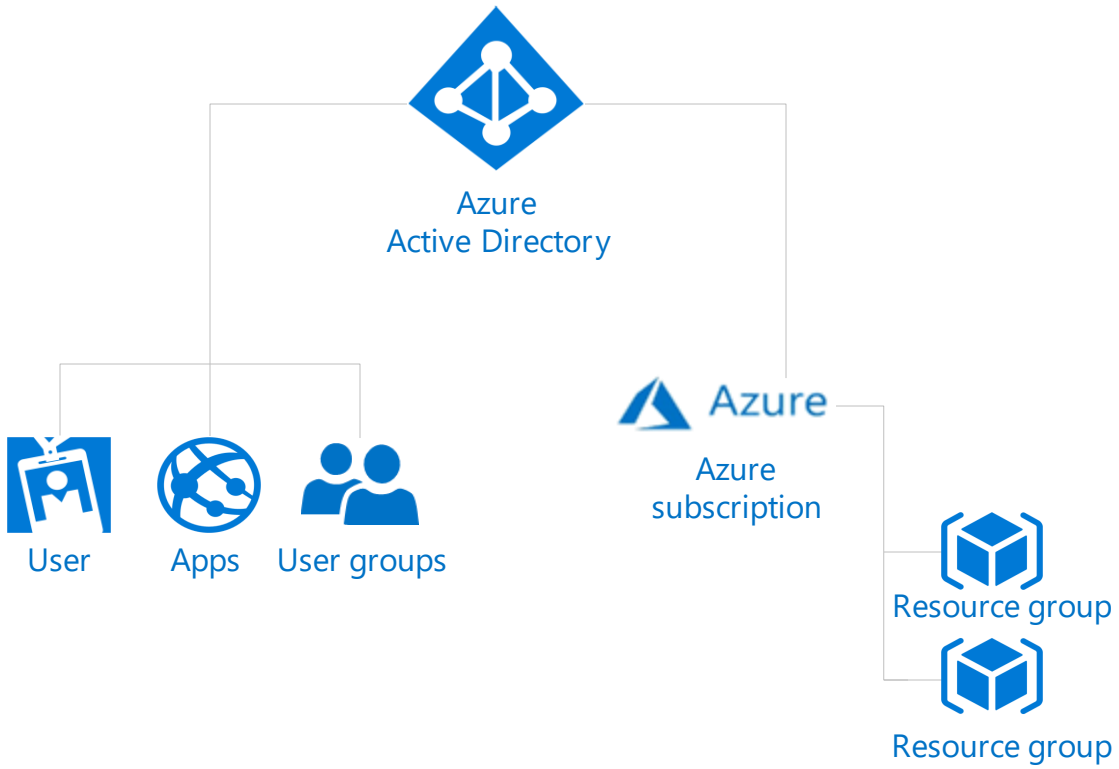


Azure Governance Methodologies - Objective Domain

Describe the functionality and the usage of:

- Role-Based Access Control (RBAC)
- Resource locks
- Tags
- Azure Policy
- Azure Blueprints
- Cloud Adoption Framework for Azure

Explore Role-based access control (RBAC)



- Fine-grained access management.
- Segregate duties within the team and grant only the amount of access to users that they need to perform their jobs.
- Enables access to the Azure portal and controlling access to resources.

Resource locks

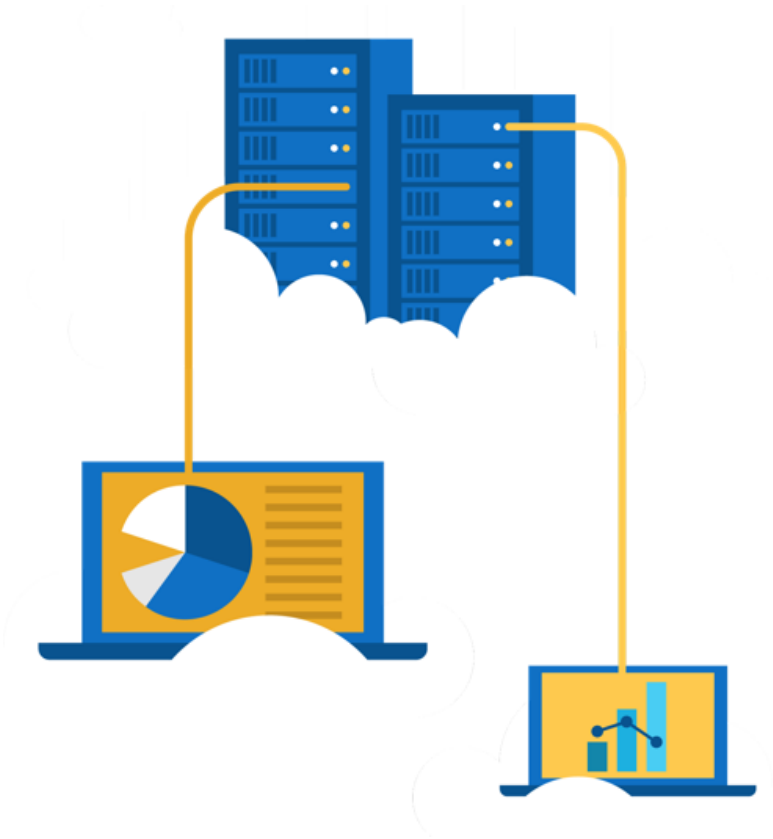
- Protect your Azure resources from accidental deletion or modification.
- Manage locks at subscription, resource group, or individual resource levels within Azure Portal.

Lock Types	Read	Update	Delete
CanNotDelete	Yes	Yes	No
ReadOnly	Yes	No	No

Walkthrough - Manage Resource Locks

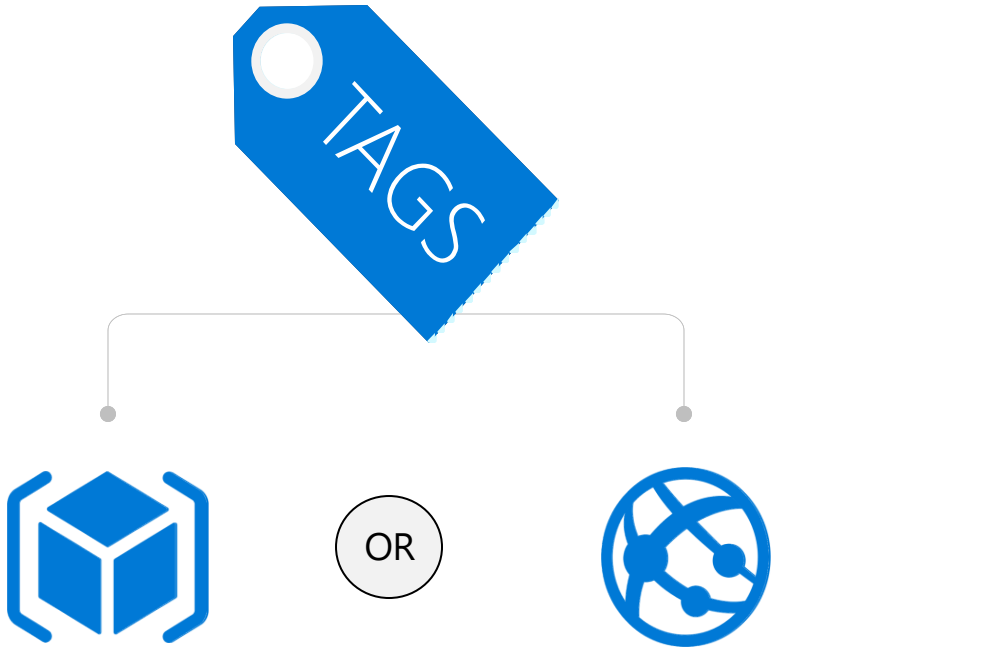
Create a resource group add a lock and test deletion, test deleting a resource in the resource group.

1. Create a resource group.
2. Add a resource lock to prevent deletion of a resource group.
3. Test deleting a member of the resource group.
4. Remove the resource lock.



Tags

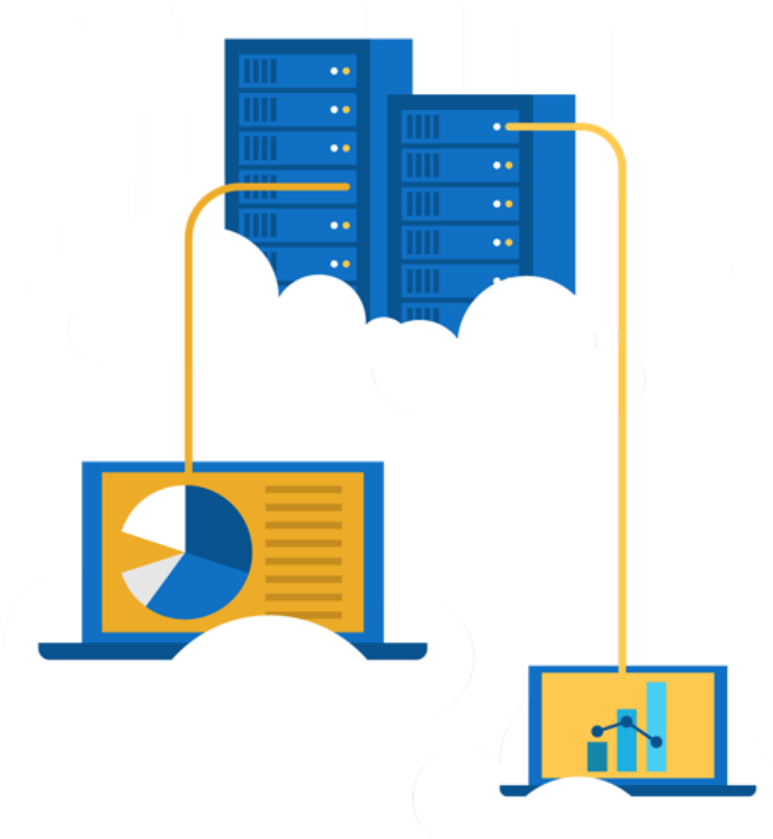
- Provides metadata for your Azure resources.
- Logically organizes resources into a taxonomy.
- Consists of a name-value pair.
- Very useful for rolling up billing information.



Walkthrough – Implement resource tagging

Create a policy assignment that requires tagging, then create a storage account and test the tagging.

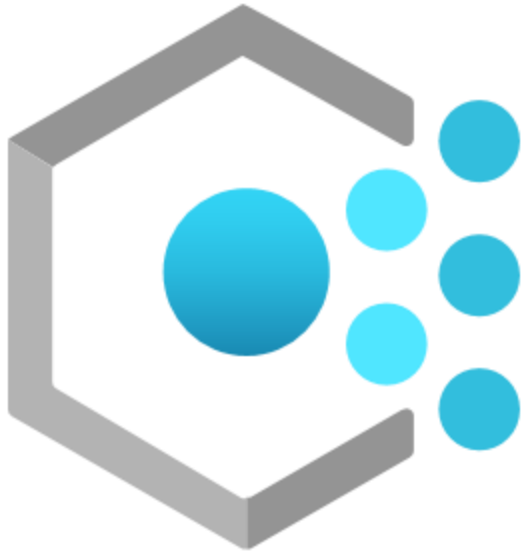
1. Create a policy assignment to require tagging.
2. Create a storage account to test required tagging.
3. View all resources with a specific tag.
4. Delete the policy assignment.



Azure Policy

Azure Policy helps to enforce organizational standards and to assess compliance at-scale. Provides governance and resource consistency with regulatory compliance, security, cost, and management.

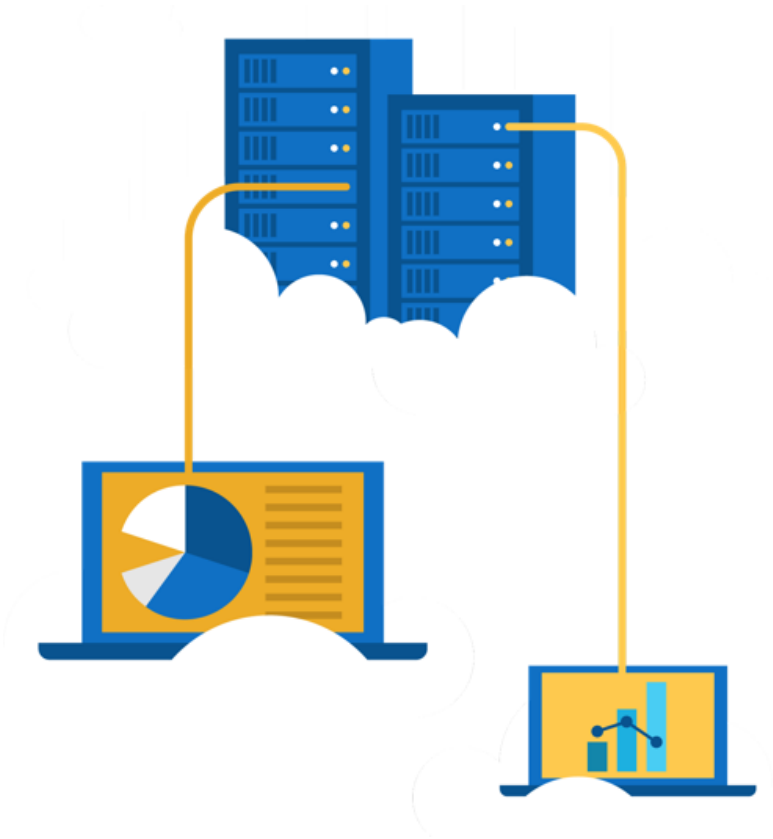
- Evaluates and identifies Azure resources that do not comply with your policies.
- Provides built-in policy and initiative definitions, under categories such as Storage, Networking, Compute, Security Center, and Monitoring.



Walkthrough - Create an Azure Policy

Create an Azure Policy to restrict deployment of Azure resources to a specific location.

1. Create a policy assignment.
2. Test the allowed location policy.
3. Delete the policy assignment.

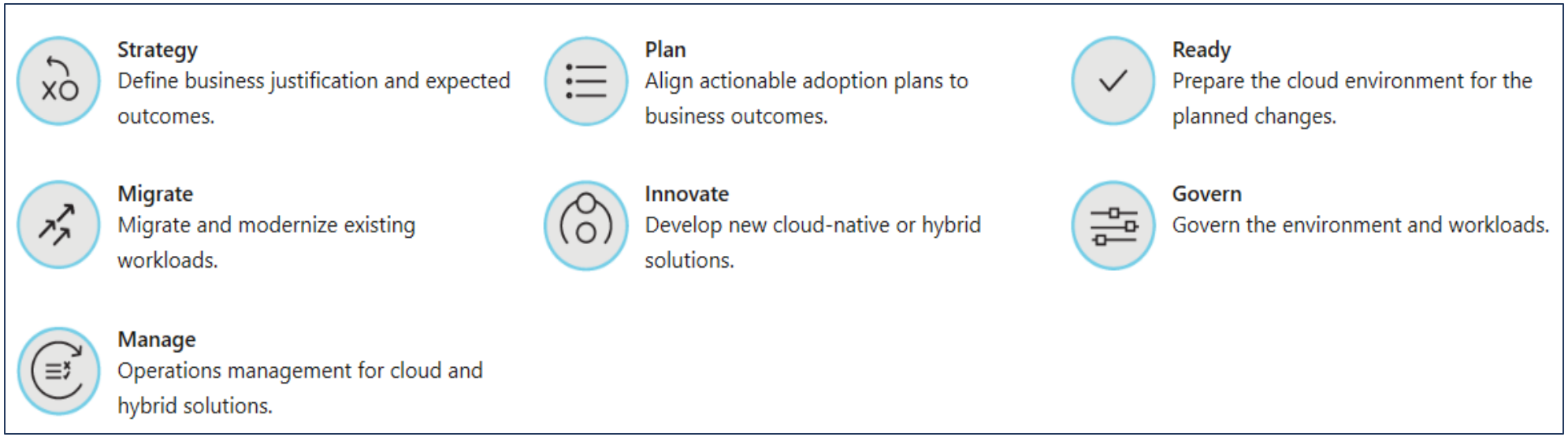


Azure Blueprints

Azure Blueprints makes it possible for development teams to rapidly build and stand up new environments. Development teams can quickly build trust through organizational compliance with a set of built-in components (such as networking) in order to speed up development and delivery.

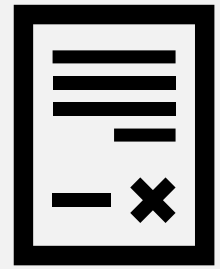
- Role Assignments
- Policy Assignments
- Azure Resource Manager Templates
- Resource Groups

Cloud Adoption Framework



- The One Microsoft approach to cloud adoption in Azure.
- Best practices from Microsoft employees, partners, and customers.
- Tools, guidance, and narratives for strategies and outcomes.

Privacy, compliance, and data protection standards



Privacy, Compliance, and Data Protection - Objective Domain

Describe the purpose of the:

- Microsoft core tenants of Security, Privacy, and Compliance
- Microsoft Privacy Statement, Online Services Terms (OST) and Data Protection Amendment (DPA)
- Trust Center
- Azure compliance documentation
- Azure Sovereign Regions (Azure Government cloud services and Azure China cloud services)

Security, Privacy, and Compliance

Security: Secure by design. With built in intelligent security, Microsoft helps to protect against known and unknown cyberthreats, using automation and artificial intelligence.

Privacy: We are committed to ensuring the privacy of organizations through our contractual agreements, and by providing user control and transparency.

Compliance: We respect local laws and regulations and provide comprehensive coverage of compliance offerings.

Compliance Terms and Requirements

Microsoft provides the most comprehensive set of compliance offerings (including certifications and attestations) of any cloud service provider. Some compliance offerings include.

CJIS Criminal Justice Information Services	**HIPAA** Health Insurance Portability and Accountability Act
CSA STAR Certification	**ISO/IEC 27018**
EU Model Clauses	**NIST** National Institute of Standards and Technology

Microsoft privacy statement

The Microsoft privacy statement provides openness and honesty about how Microsoft handles the user data collected from its products and services.

The Microsoft privacy statement explains:

- What data Microsoft processes.
- How Microsoft processes it.
- What purposes the data is used for.

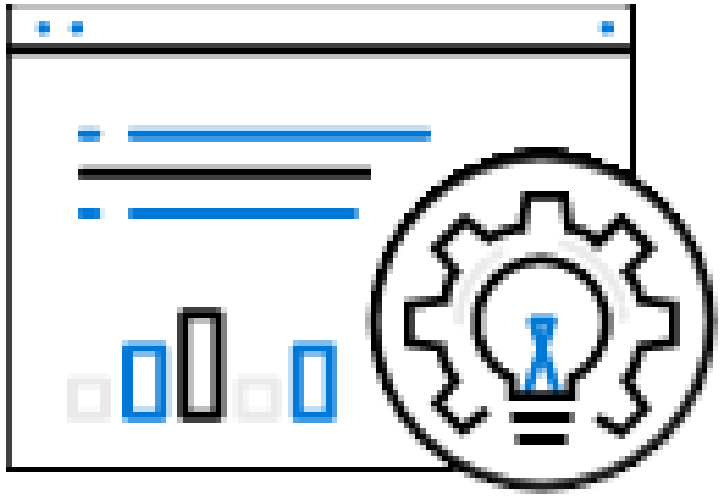
Online Services Terms and Data Protection Addendum

Online Services Terms: The licensing terms define the terms and conditions for the products and Online Services you purchase through Microsoft Volume Licensing programs.

Data Protection Addendum: The DPA sets forth the obligations, with respect to the processing and security of Customer Data and Personal Data, in connection with the Online Services.

Trust Center

Learn about security, privacy, compliance, policies, features, and practices across Microsoft's cloud products.



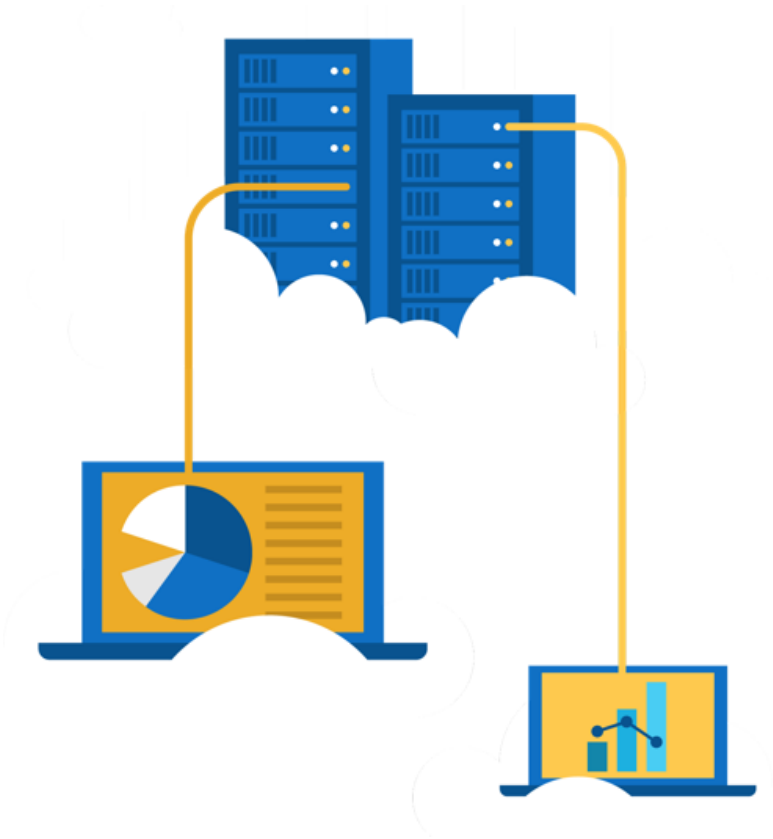
The Trust Center website provides:

- In-depth, expert information.
- Curated lists of recommended resources, arranged by topic.
- Role-specific information for business managers, administrators, engineers, risk assessors, privacy officers, and legal teams.

Walkthrough – Exploring the Trust Center

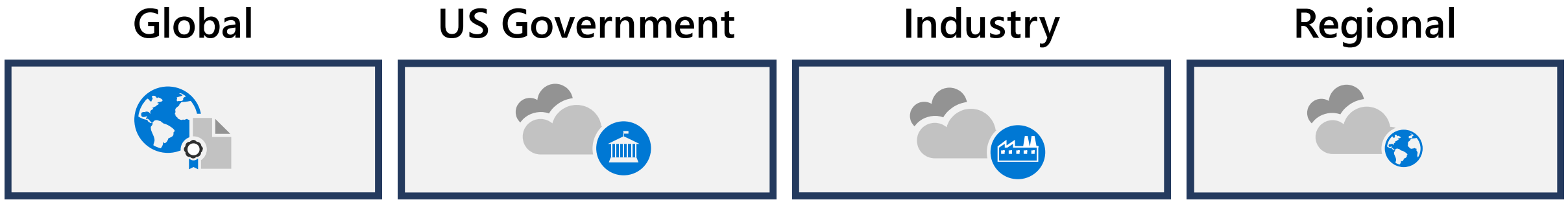
Access the Trust Center, Service Trust Portal (STP), and Compliance Manager.

1. Access the Trust Center.
2. Access the Service Trust Portal.
3. Access the Compliance Manager.



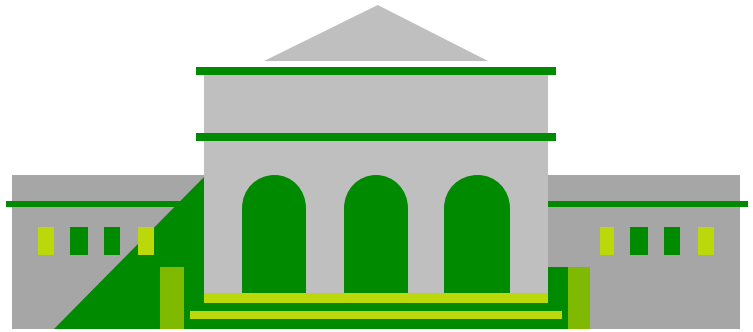
Azure Compliance Documentation

Microsoft offers a comprehensive set of compliance offerings to help your organization comply with national, regional, and industry-specific requirements that govern the collection and use of data.



Azure Sovereign Regions (US Government services)

Meets the security and compliance needs of US federal agencies, state and local governments, and their solution providers.



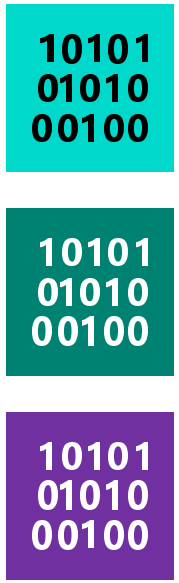
Azure Government:

- Separate instance of Azure.
- Physically isolated from non-US government deployments.
- Accessible only to screened, authorized personnel.

Examples of compliant standards : FedRAMP, NIST 800.171 (DIB), ITAR, IRS 1075, DoD L2, L4 & L5, and CJIS.

Azure Sovereign Regions (Azure China)

Microsoft is China's first foreign public cloud service provider, in compliance with government regulations.



Azure China features:

- Physically separated instance of Azure cloud services operated by 21Vianet
- All data stays within China to ensure compliance

Module 05 Review

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

- Azure identity services
- Authentication versus authorization
- Azure AD, MFA, SSO and Conditional Access
- Azure governance features
- RBAC, Resource locks and tags
- Policy, Blueprints, and CAF
- Azure privacy and compliance
- Privacy Statement, Online Services Terms, Trust Center and compliance documentation.
- Azure Sovereign Regions

Microsoft

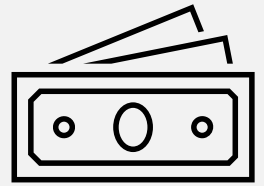
MOD 6: Azure pricing and lifecycles

Module 06 – Outline

You will learn the following concepts:

- **Methods for managing costs**
  - Factors affecting costs
  - Options to reduce and control costs
  - Azure Cost Management
- **Service Level Agreements and Lifecycles**
  - Azure Service Level Agreement (SLA)
  - Factors impacting SLAs
  - Azure product and feature lifecycle

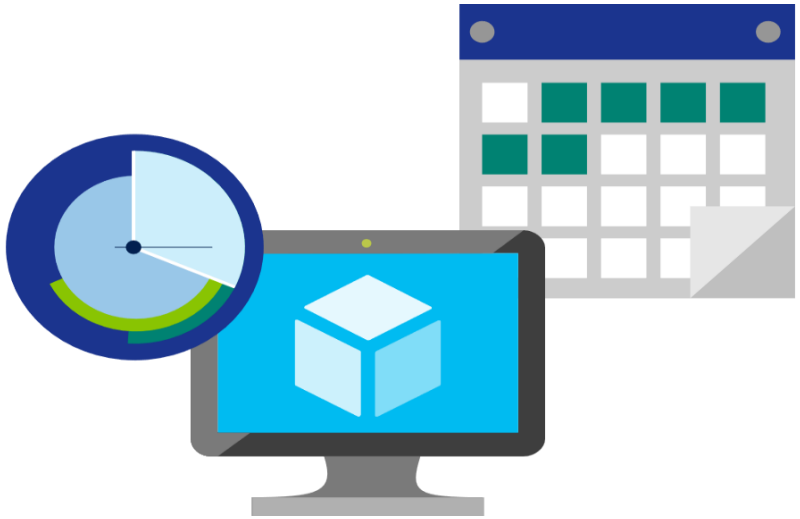
Planning and Cost Management



Planning and Cost Management - Objective Domain

- Identify factors that can affect costs (resource types, services, locations, ingress and egress traffic)
- Identify factors that can reduce costs (reserved instances, reserved capacity, hybrid use benefit, and spot pricing)
- Describe the functionality and usage of the Pricing calculator and the Total Cost of Ownership (TCO) calculator
- Describe the functionality and usage of Azure Cost Management

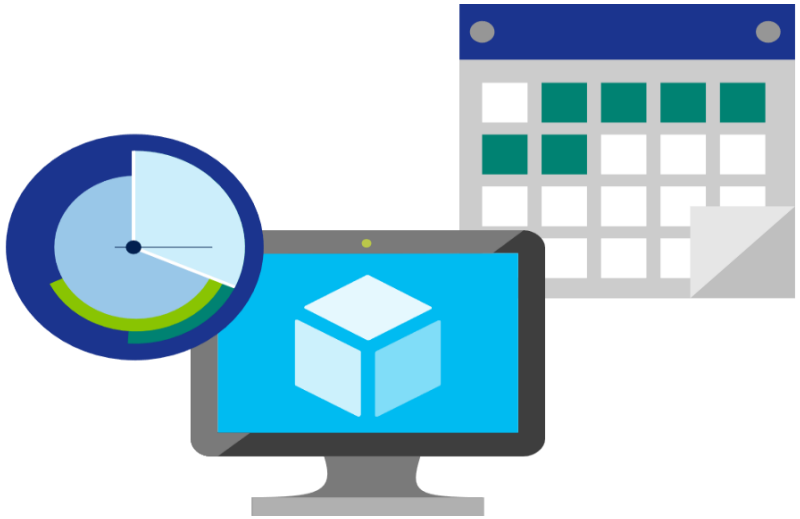
Factors affecting costs (part 1)



There are six primary factors affecting costs:

1) Resource Type	2) Services	3) Location
Costs are resource-specific, so the usage that a meter tracks and the number of meters associated with a resource, depend on the resource type.	Azure usage rates and billing periods can differ between Enterprise, Web Direct, and CSP customers.	The Azure infrastructure is globally distributed, and usage costs might vary between locations that offer Azure products, services, and resources.

Factors affecting costs (part 2)



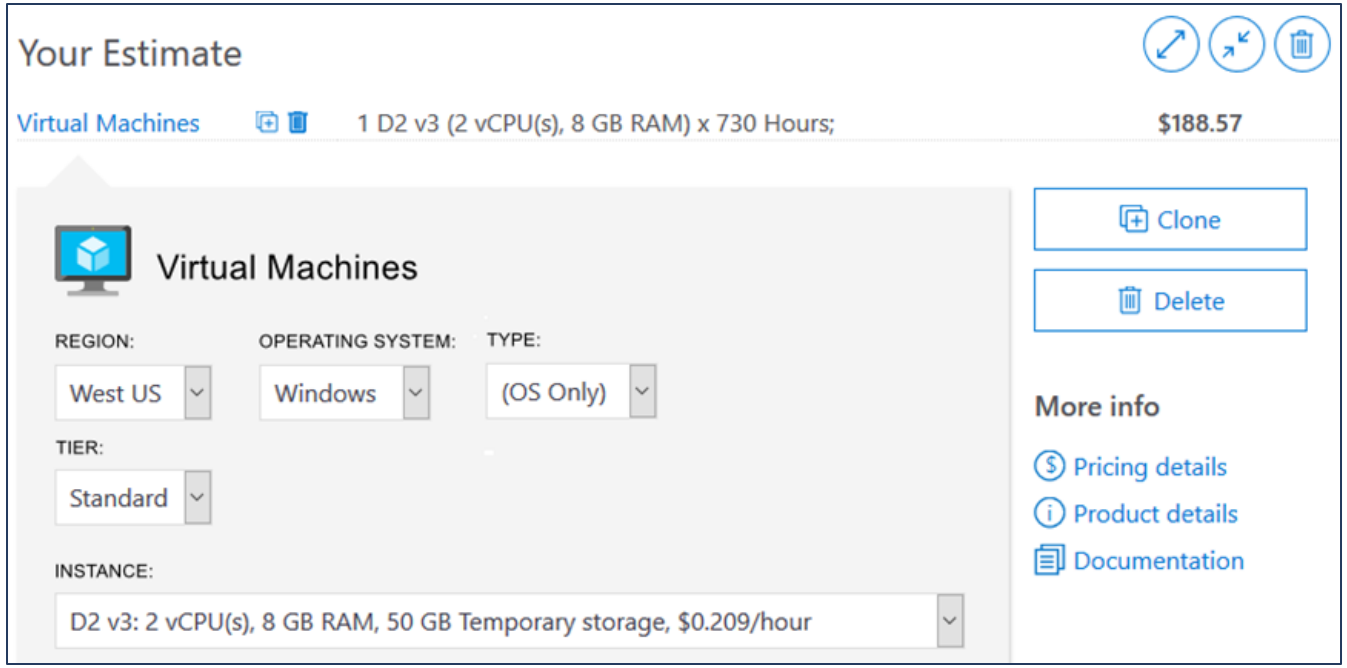
There are six primary factors affecting costs:

4) Bandwidth	5) Reserved Instances	6) Azure Hybrid Use Benefit
Some inbound data transfers are free, such as data going into Azure datacenters. For outbound data transfers, such as data going out of Azure datacenters, pricing is based on Zones.	With Azure Reservations, you commit to buying one-year or three-year plans for multiple products. Reservations can significantly reduce your resource costs up to 72% on pay-as-you-go prices.	For customers with Software Assurance, Azure Hybrid Benefit allows you to use your on-premises licenses on Azure at a reduced cost.

Pricing Calculator

The **Pricing Calculator** is a tool that helps you estimate the cost of Azure products. The options that you can configure in the Pricing Calculator vary between products, but basic configuration options include:

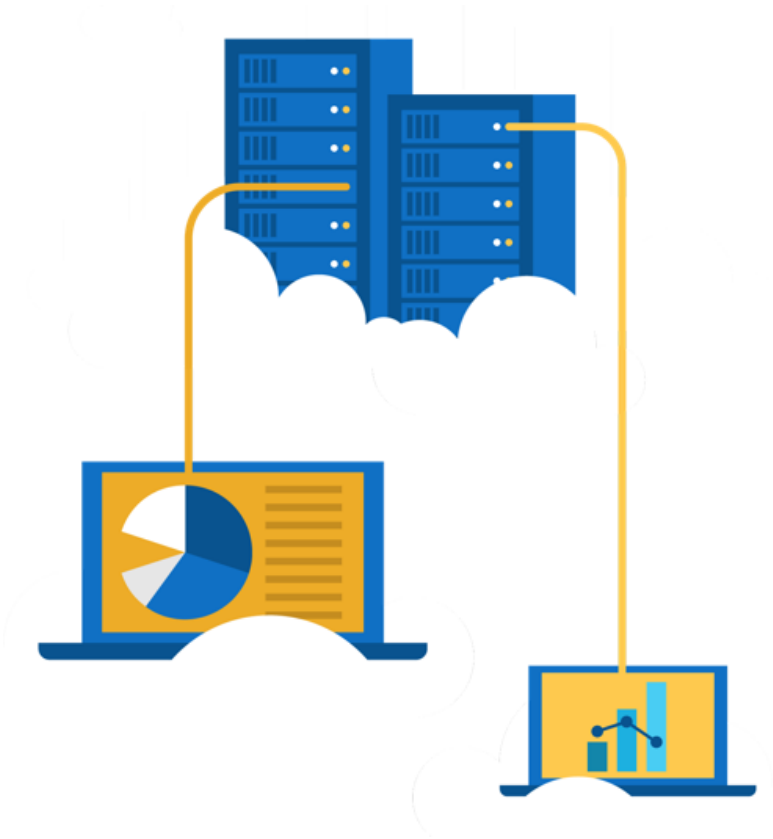
- Region
- Tier
- Billing options
- Support options
- Programs and offers
- Azure dev/test pricing



Walkthrough - Use the Azure Pricing Calculator

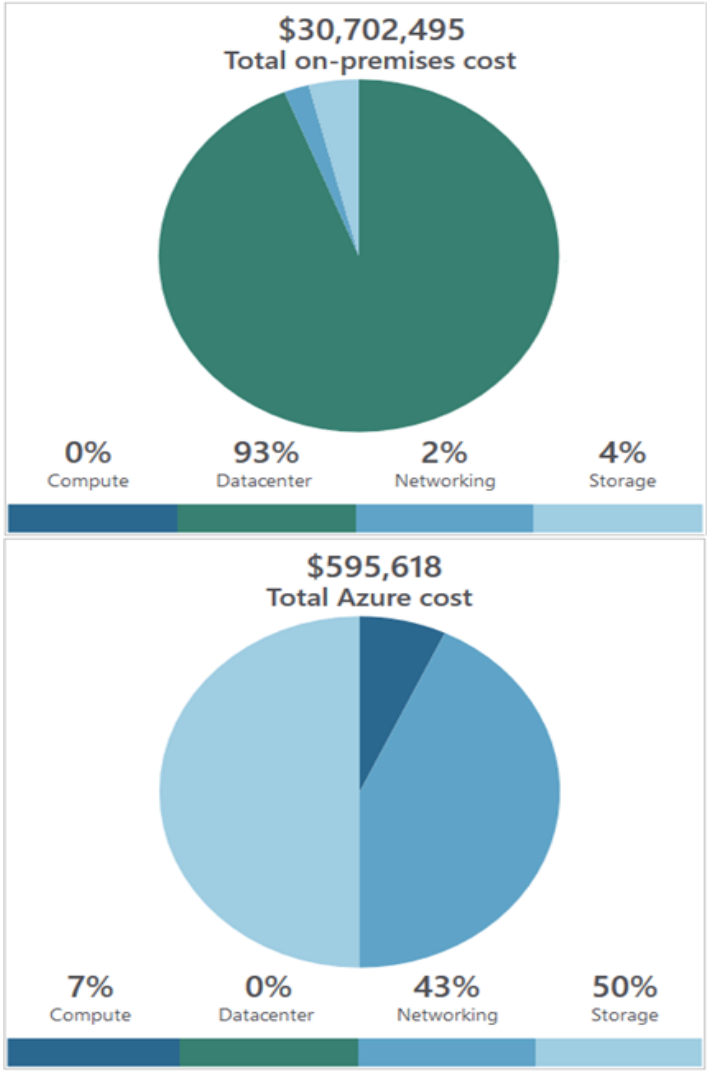
Use the Azure Pricing Calculator to generate a cost estimate for an Azure virtual machine and related network resources.

1. Configure the pricing calculator.
2. Review the pricing estimate.



Total Cost of Ownership Calculator

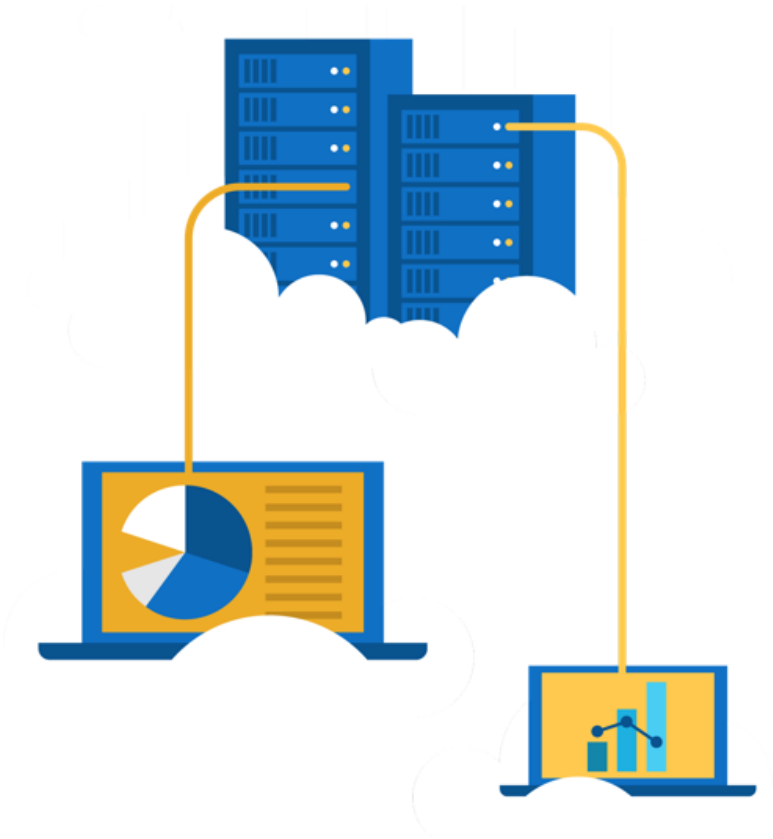
- A tool to estimate cost savings you can realize by migrating to Azure.
- A report compares the costs of on-premises infrastructures with the costs of using Azure products and services in the cloud.



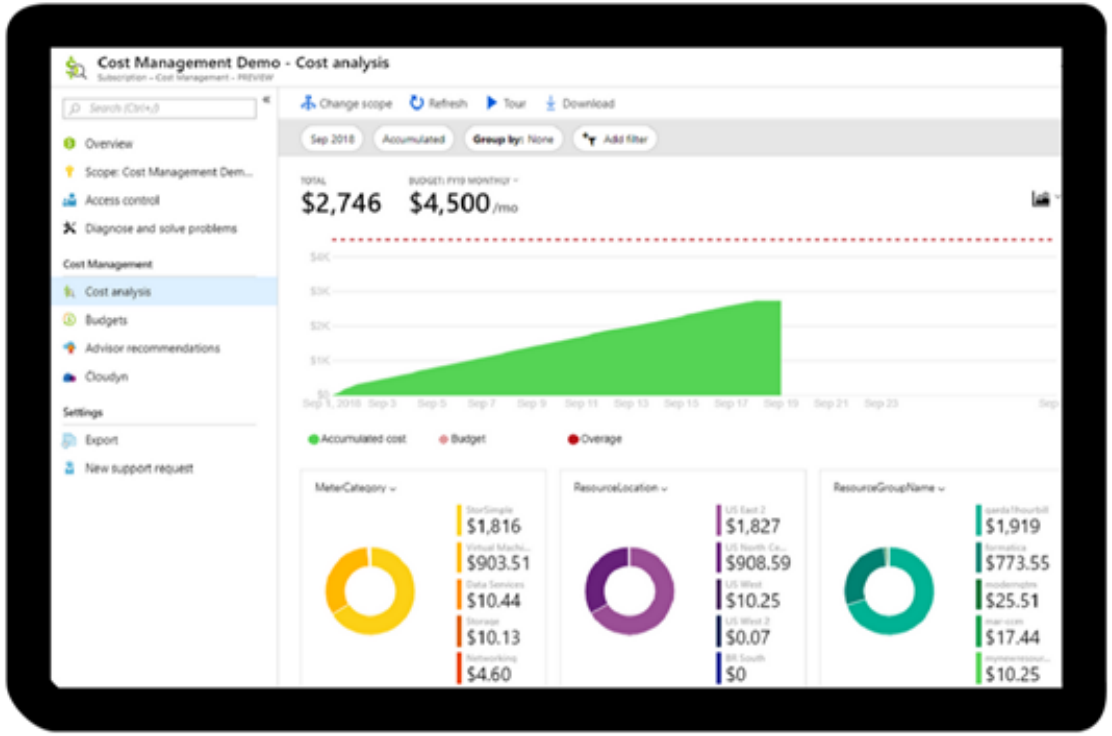
Walkthrough - Use the Azure TCO Calculator

Use the Total Cost of Ownership (TCO) Calculator to generate cost comparison report for an on-premises environment.

1. Configure the TCO calculator.
2. Review the results and save a copy.

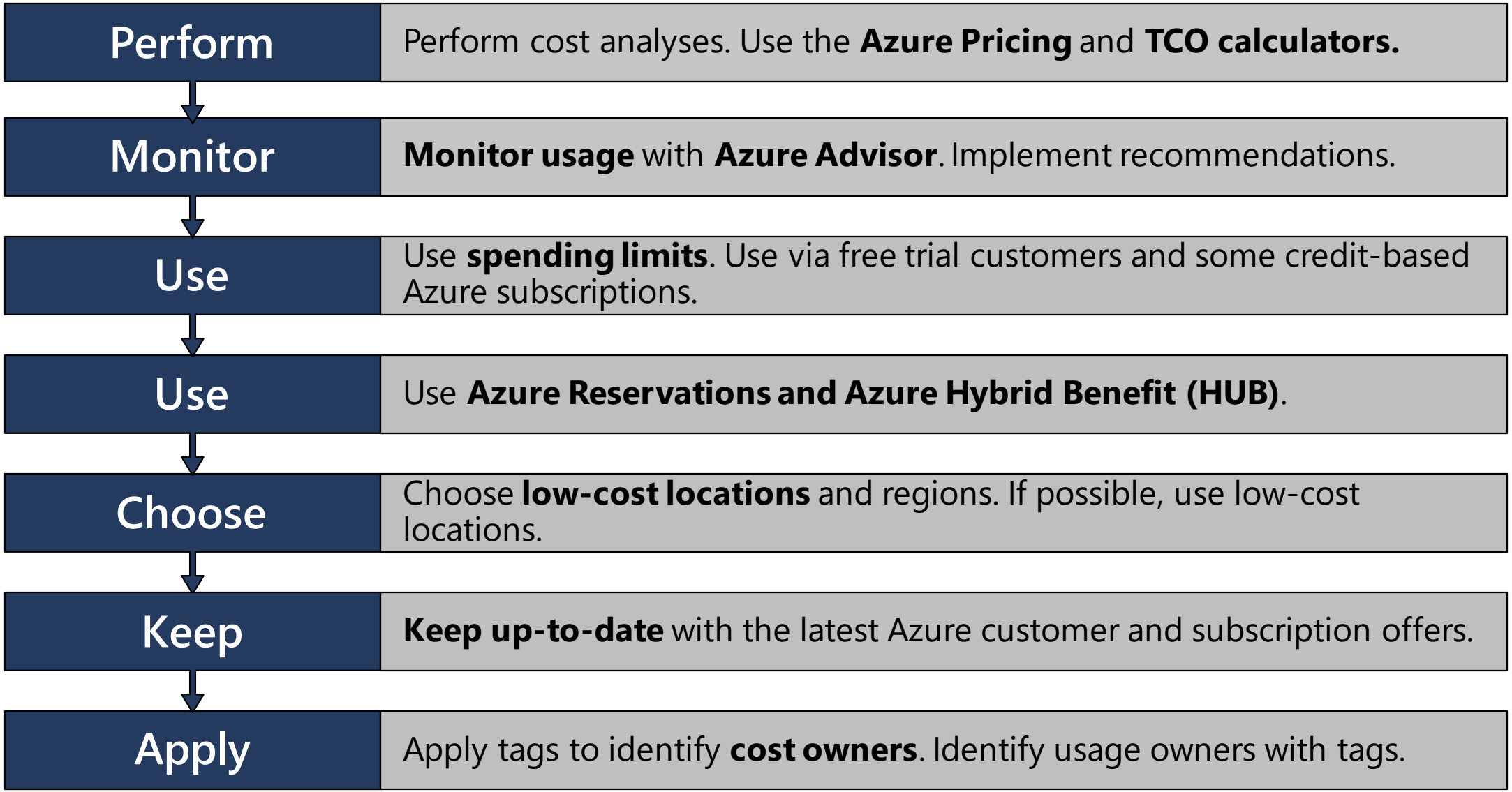


Azure Cost Management

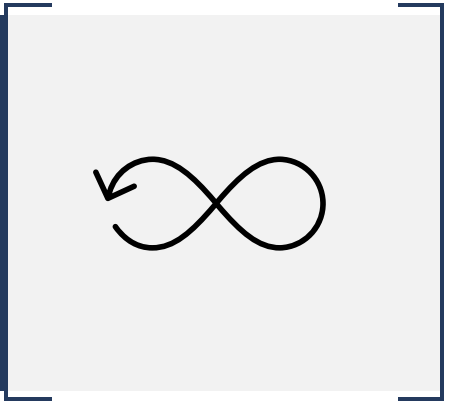


- Reporting – billing reports
- Data enrichment
- Budgets – set spend budget
- Alerting – when cost exceed limits
- Recommendation – cost recommendations

Minimizing costs



Azure SLAs and service lifecycles



Azure SLAs and service lifecycles - Objective Domain

- Describe the purpose of an Azure Service Level Agreement (SLA)
- Identify actions that can impact an SLA (i.e. Availability Zones)
- Describe the service lifecycle in Azure (Public Preview and General Availability)

Service Level Agreements (SLAs)

Service Level Agreements (SLAs) describes Microsoft's commitments for uptime and connectivity.

- SLAs are based on individual products and services.
- Detailed agreements on the service provided, and any exceptions to the SLA.
- Free and preview features/services do not offer SLAs.

SLAs for Azure products and services

- Performance targets are expressed as uptime and connectivity guarantees.
- Performance-targets range from 99% to 99.999%.
- If a service fails to meet the guarantees, a percentage of the monthly service fees can be credited.

SLA	Downtime per month
99%	7h 18m 17s
99.5%	3h 39m 8s
99.9%	43m 49s
99.95%	21m 54s
99.99%	4m 22s
99.999%	26s

Actions that affect SLAs

Lower your SLA

- Adding more services
- Choosing free or non-SLA services

Raise your SLA

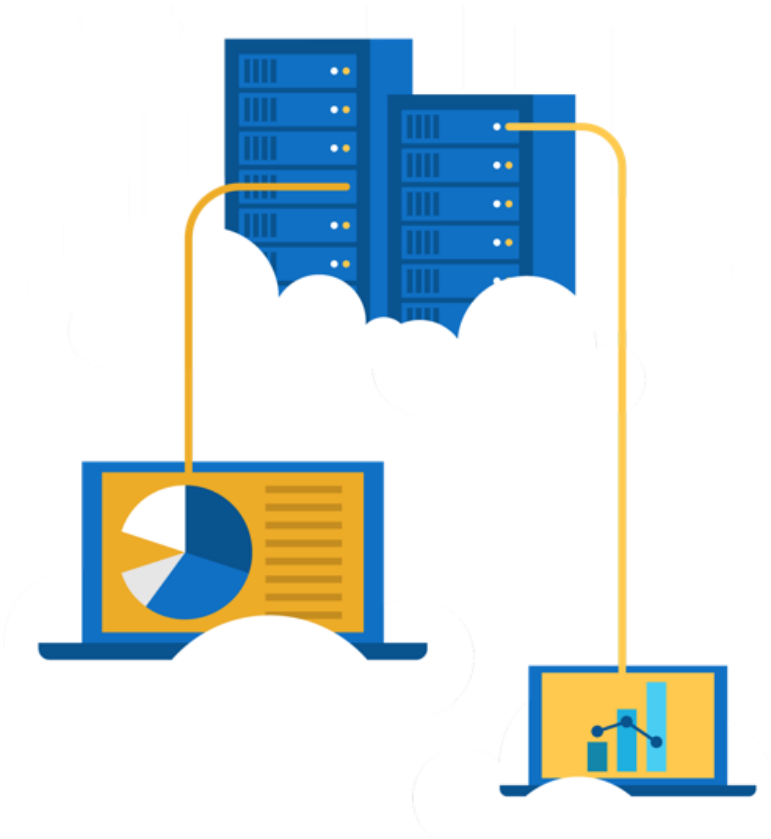
- Availability Zones
- Redundant systems

Many factors can raise or lower your SLA. Design decisions based on business goals will drive your SLA goals.

Walkthrough - Calculate a Composite SLA

Determine services SLA uptime percentages and then calculate the application composite SLA uptime percentage.

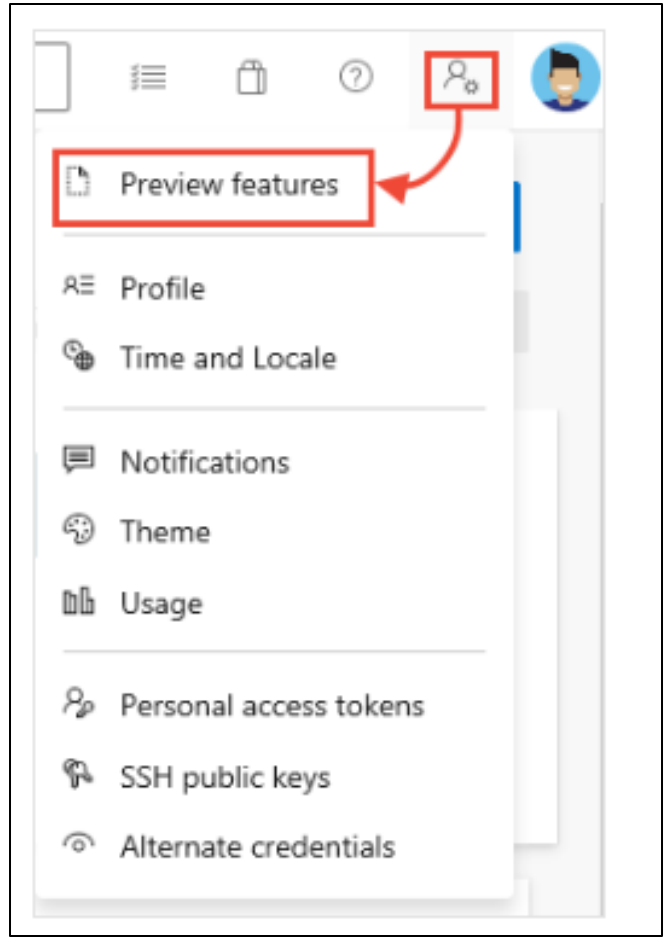
1. Determine the SLA uptime percentage values for an application.
2. Calculate the Application Composite SLA percentage uptime.



Azure Preview Program

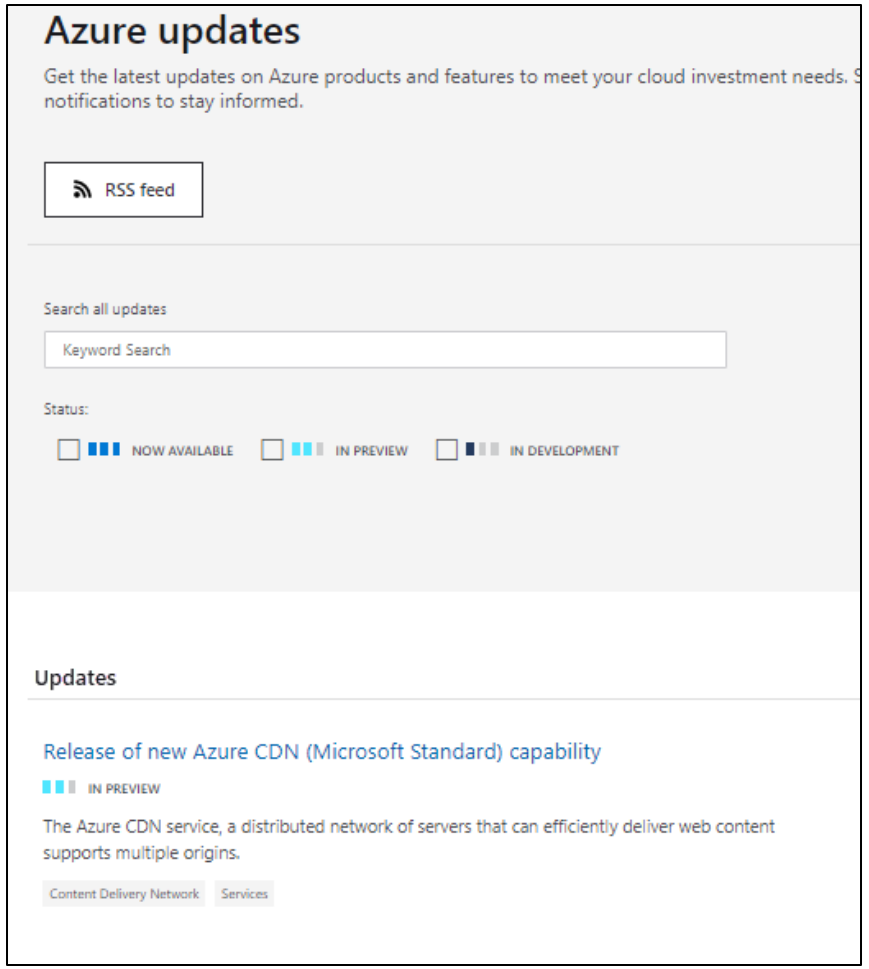
With Azure previews, users can test beta and other pre-release features, products, services, software, and regions to provide feedback.

- **Public Preview:** all Azure customers can evaluate the new features
- **Generally available (GA):** after public preview is completed, all customers can use the feature, and region availability will vary.



Monitoring service and feature updates

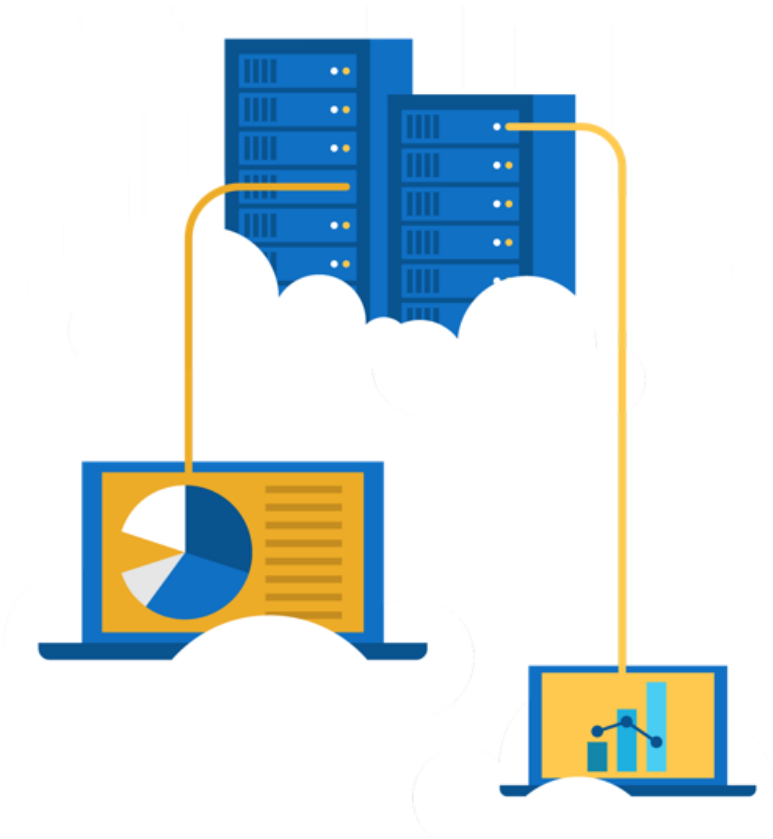
- Azure updates provides information about the Azure products, services, and features, in addition to product roadmaps and availability.
- View details about all Azure updates and their status.
- Browse and search for updates.
- Subscribe to Azure update notifications by RSS.



Walkthrough - Access Azure Preview features

Access and identify Azure preview services and features and view the latest Azure updates information.

1. Access preview services and features.
2. Review the Azure updates page.



Module 06 Review

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

- Factors affecting costs
- Recognize Azure Cost Management
- Azure Service Level Agreement (SLA)
- Factors impacting SLAs
- Azure product and feature lifecycle