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# Microsoft Azure Virtual Training Day: Fundamentals





# **Azure Fundamentals**

Cloud fundamentals



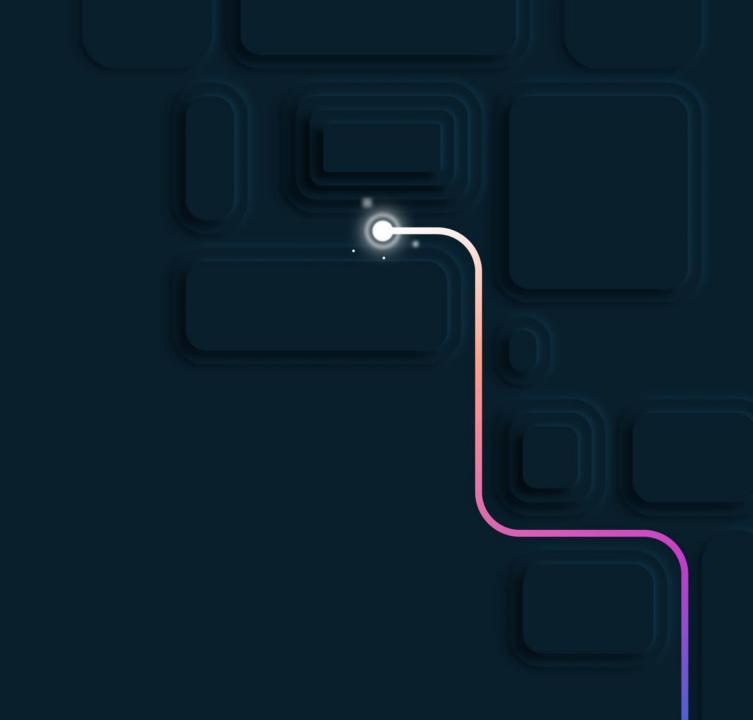
#### **Outline**

You will learn the following concepts:

- Cloud Computing
  - What is cloud computing
  - Shared responsibility
  - Cloud models
  - Capital vs Operational costing
- Cloud Benefits
  - Benefits of the cloud
- Cloud Service Types
  - o laaS, PaaS, and SaaS

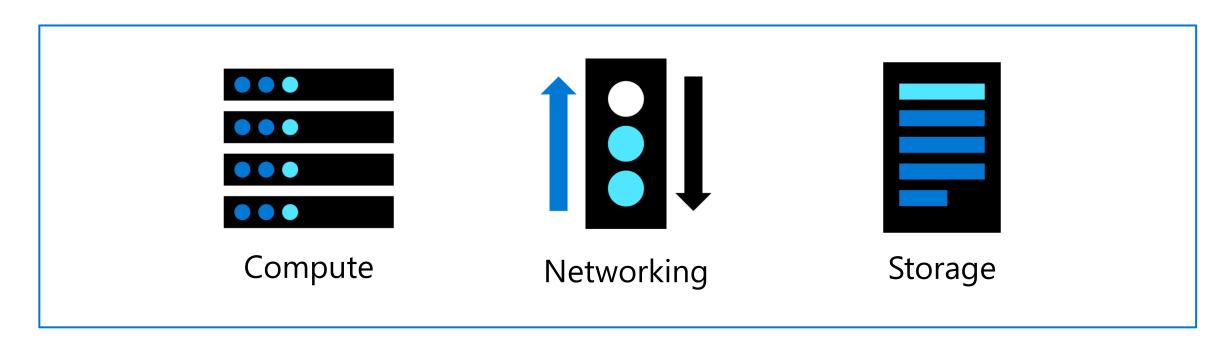


# Cloud Computing



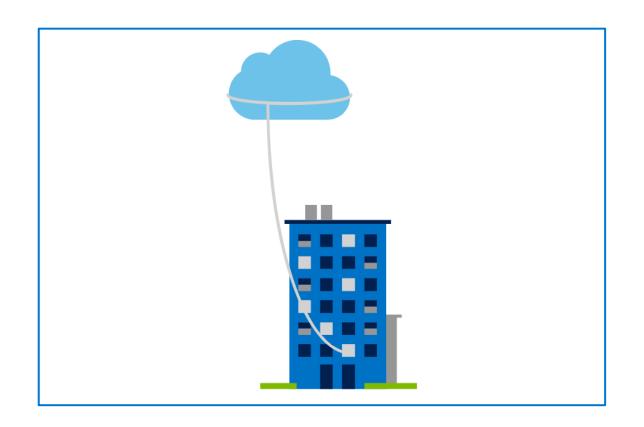
## What is cloud computing?

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



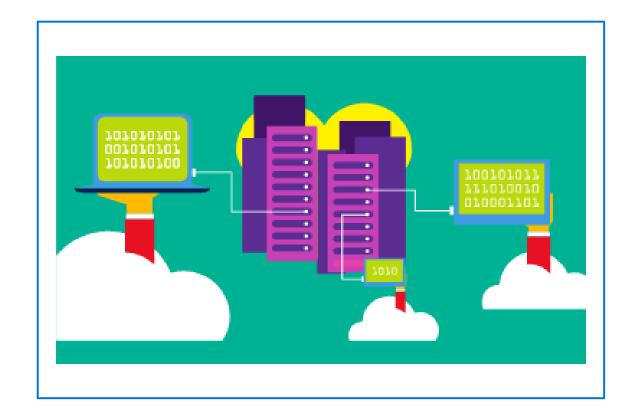
#### **Private cloud**

- 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.

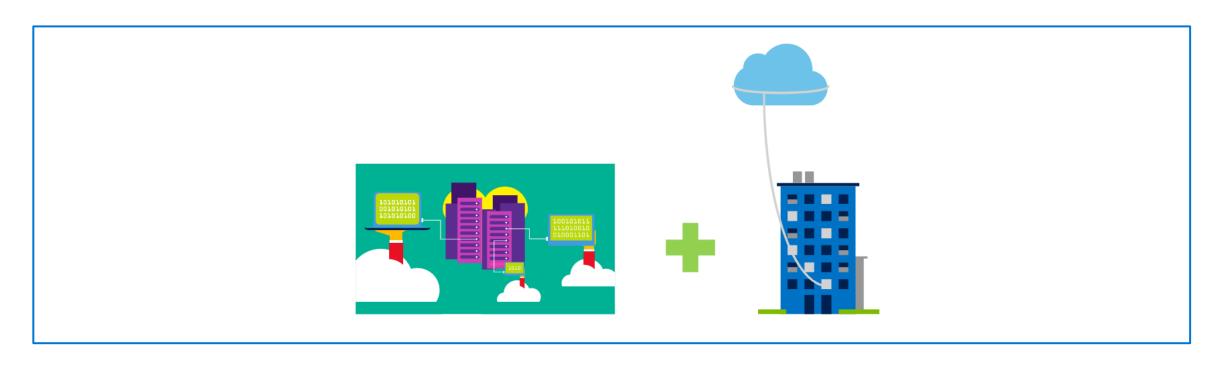


#### Public cloud

- 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).



## **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

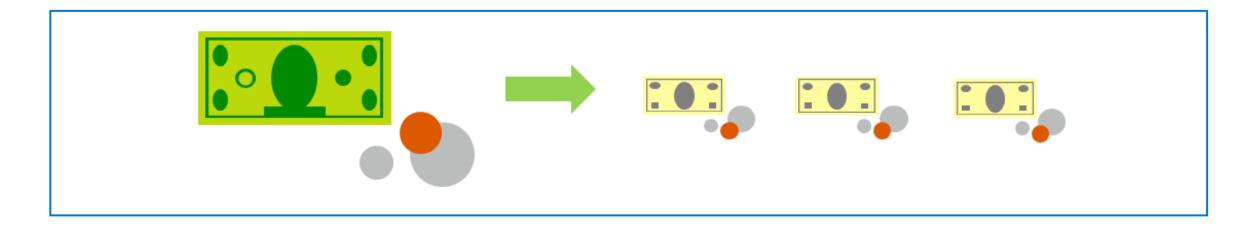
#### Compare CapEx vs. OpEx

#### 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)

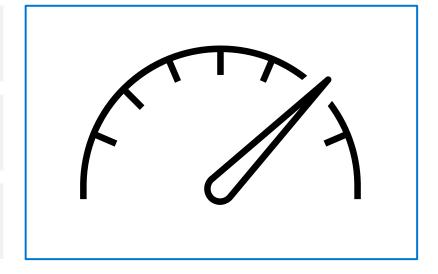
- Spend on products and services as needed, payas-you-go
- Get billed immediately



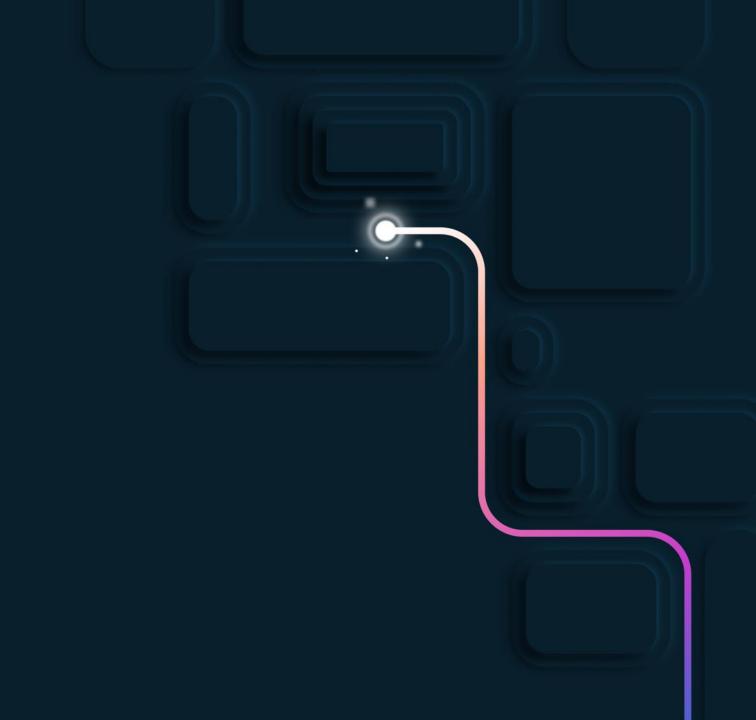
#### Consumption-based model

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 benefits**



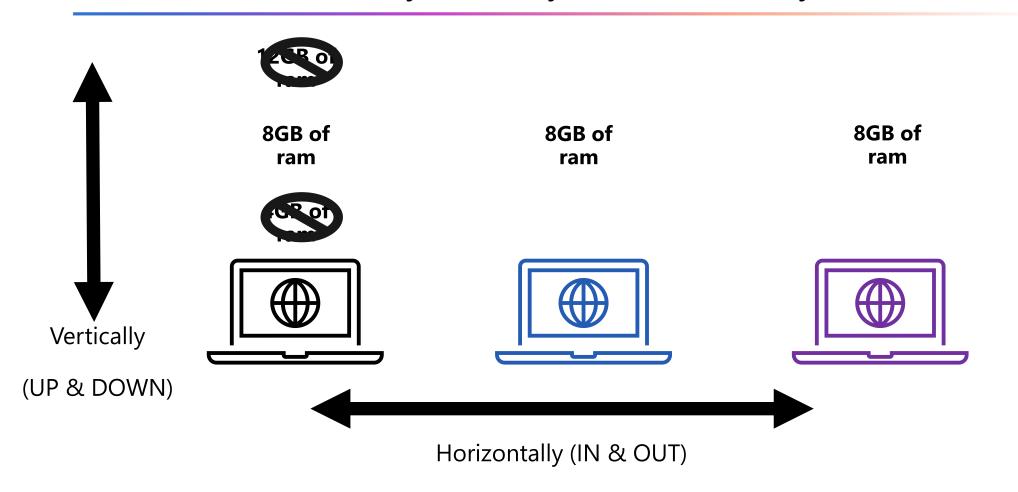
#### **Cloud Benefits**

High availability

Scalability

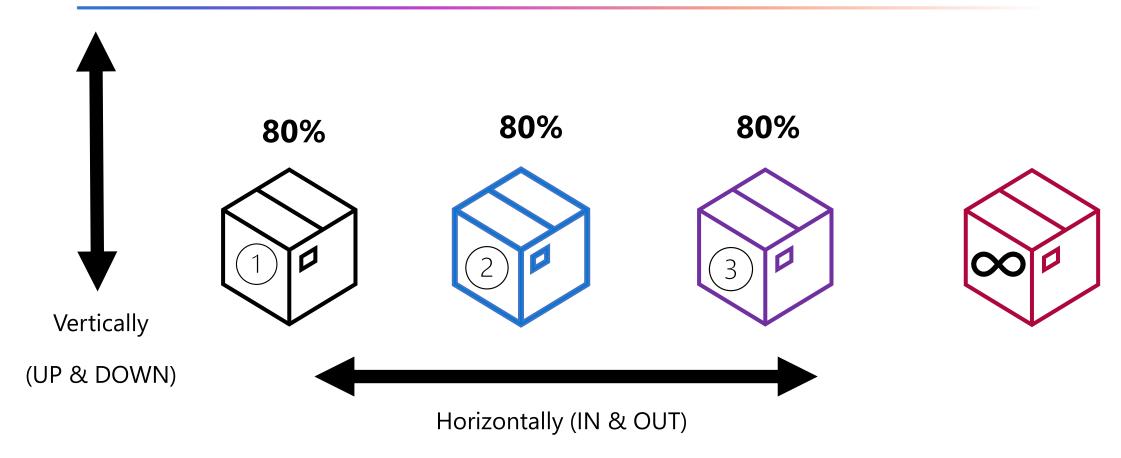
**Elasticity** 

# <u>Scalability - The ability to scale Vertically (up or down), and horizontally (in or out)</u> <u>Elasticity - The ability to scale automatically</u>



#### Scalability - The ability to scale Vertically (up or down), and horizontally (in or out)

#### **Elasticity - The ability to scale automatically**



#### **Cloud Benefits**

High availability

Scalability

Predictability

Security

Governance

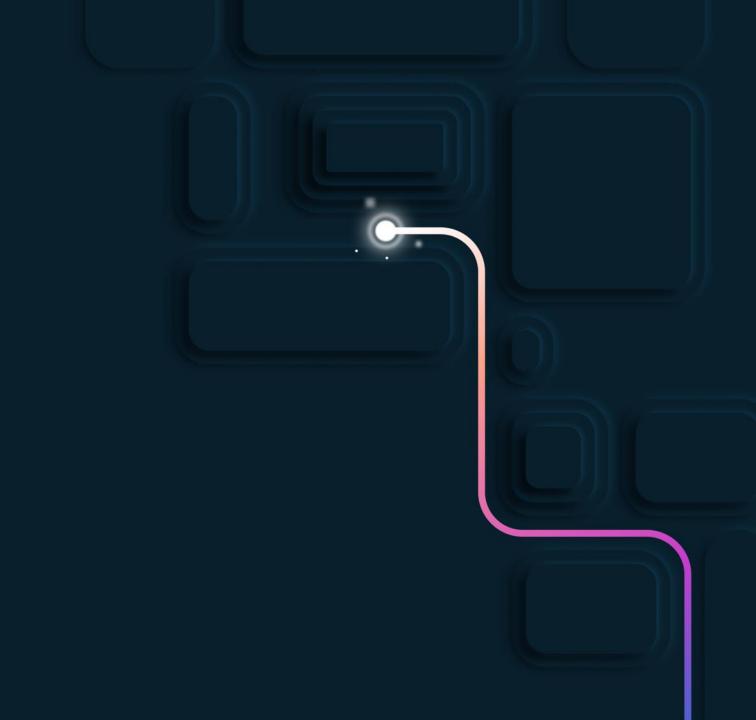
Manageability

Elasticity

Reliability

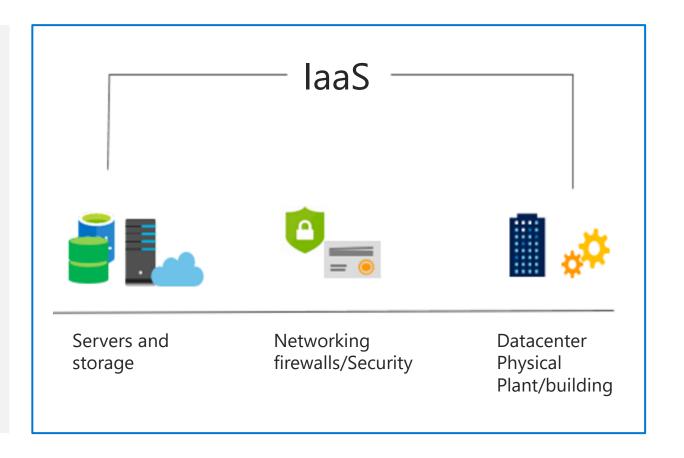
Manageability

Cloud service types



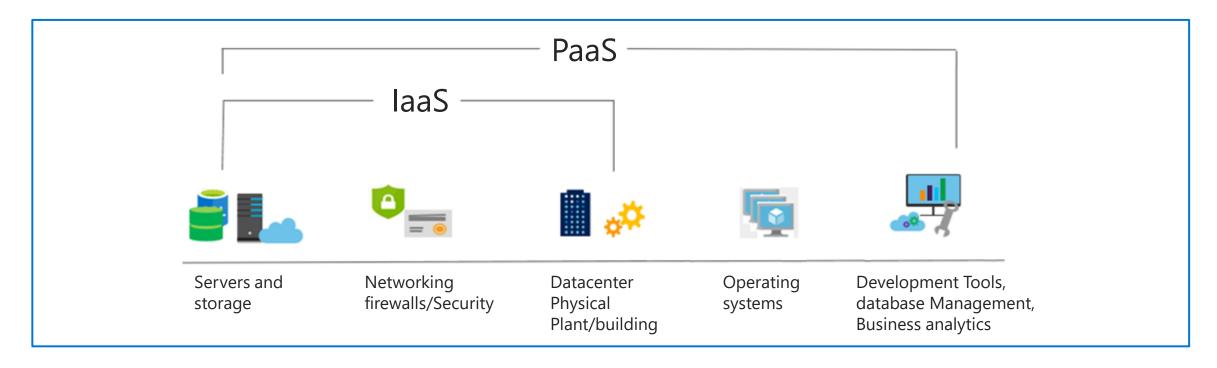
#### Infrastructure as a Service (laaS)

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



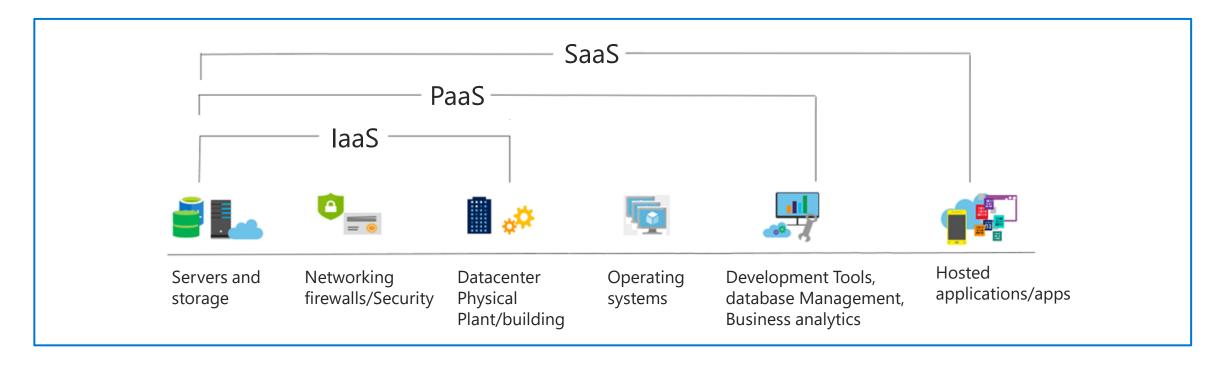
#### Platform as a Service (PaaS)

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



#### Software as a Service (SaaS)

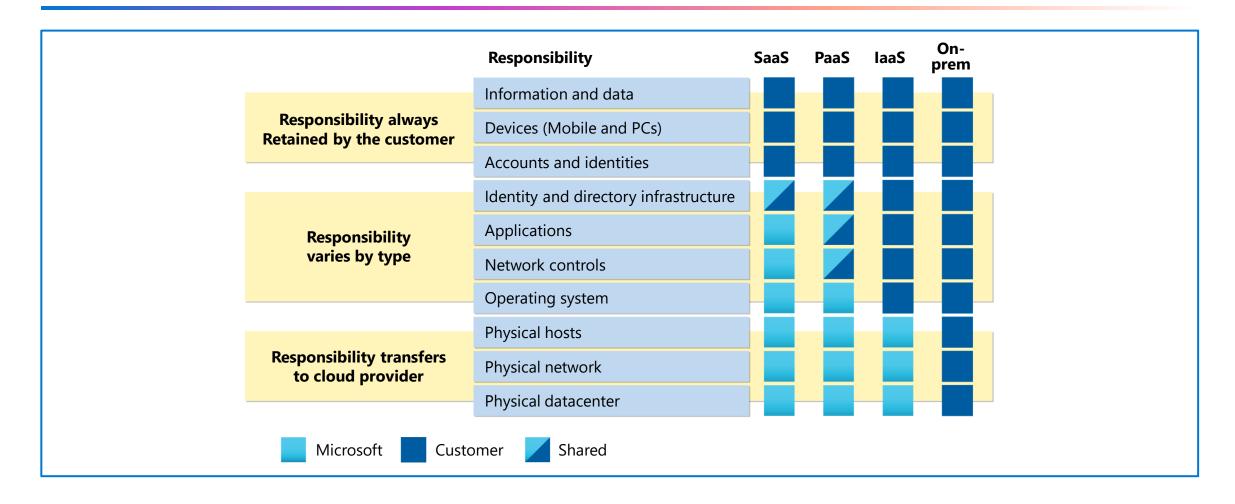
Users connect to and use cloud-based apps over the internet: for example, Microsoft Office 365, email, and calendars.



#### Cloud service comparison

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

### Shared responsibility model



#### **Module 01 Review**

- The shared responsibility model
- Public, private, and hybrid-cloud
- Benefits of cloud computing
- Cloud service types



# Azure Fundamentals

Azure architecture Azure compute services



#### **Outline**

You will learn the following concepts:

- Azure Architectural Components
  - o Regions and Availability Zones
  - Subscriptions and Resource Groups
- Compute
  - Compute types
  - Application hosting



# Azure architecture

### 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.

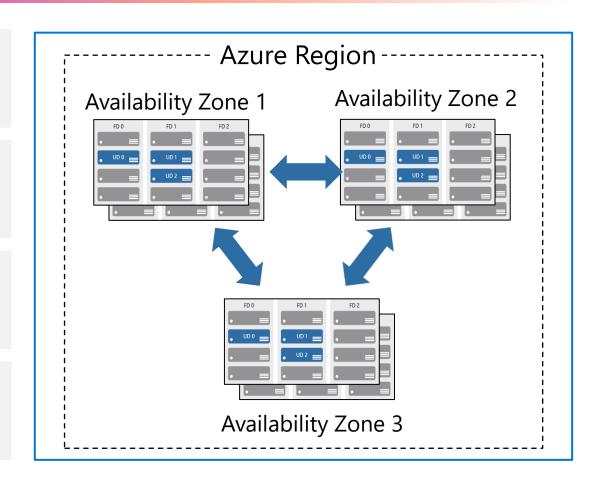
### **Availability zones**

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



### **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.

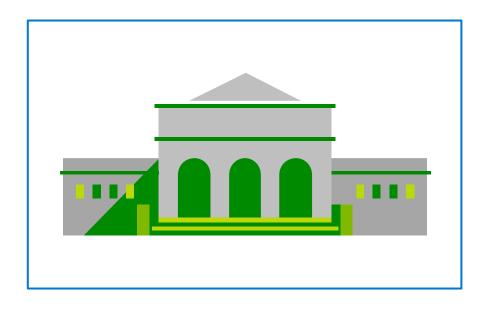
Web Link: <a href="https://aka.ms/PairedRegions">https://aka.ms/PairedRegions</a>

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



### Azure Sovereign Regions (US Government services)

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

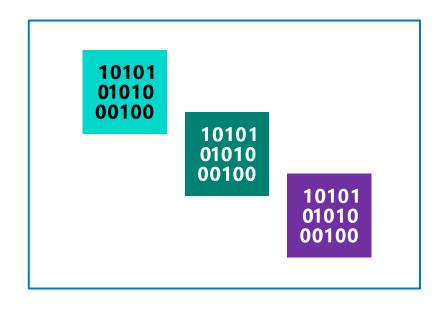


#### **Azure Government:**

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

#### Azure Sovereign Regions (Azure China)

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



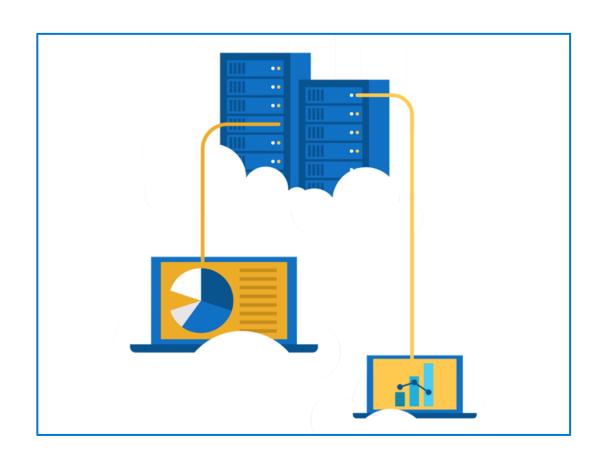
#### **Azure China features:**

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

# Demonstration – Explore the Azure global infrastructure

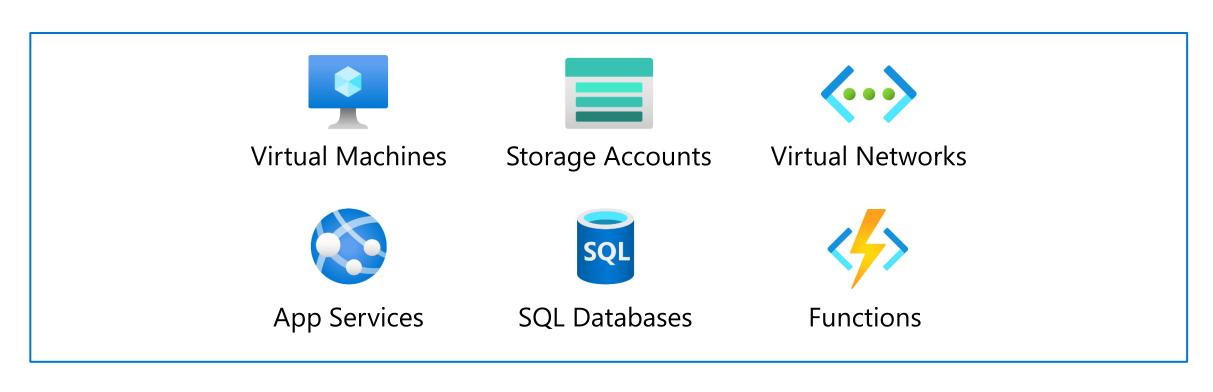
#### **Explore the Azure global infrastructure**

- Select Explore the Globe (after intro)
- 2. Notice the different icons (geography, regions, points of presence (PoP), and so on)
- 3. Find your location on the globe, then find the nearest PoP and region to your location



#### **Azure Resources**

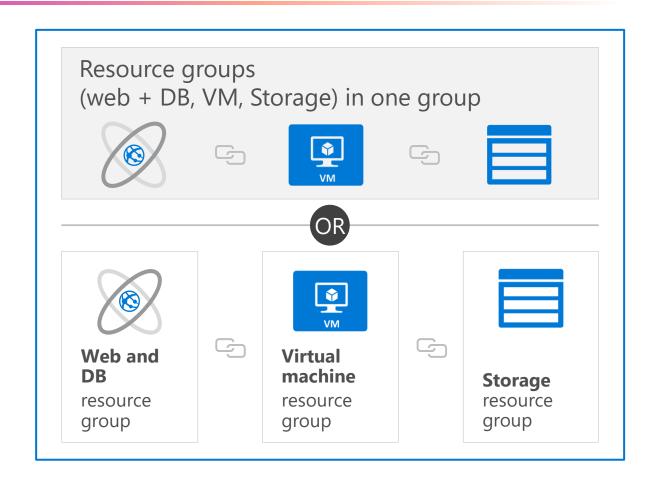
Azure **resources** are components like storage, virtual machines, and networks that are available to build cloud solutions.



#### Resource groups

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

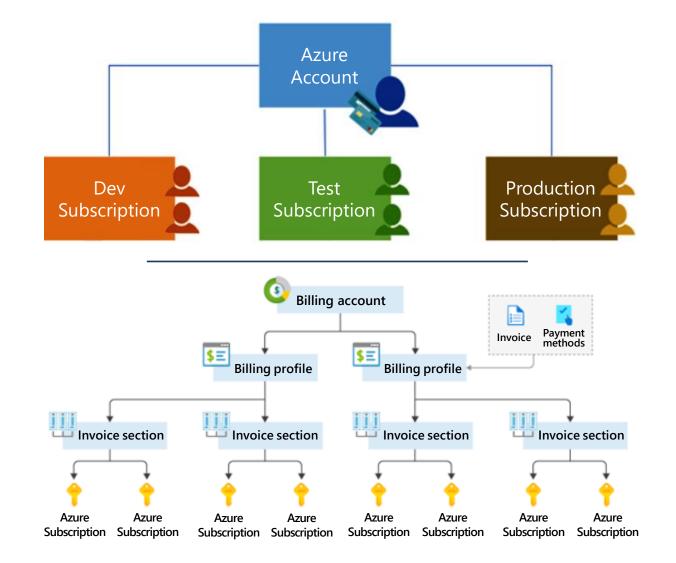
- Resources can exist in only one resource group.
- Resources can exist in different regions.
- Resources can be moved to different resource groups.
- Applications can utilize multiple resource groups.



#### **Azure 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.



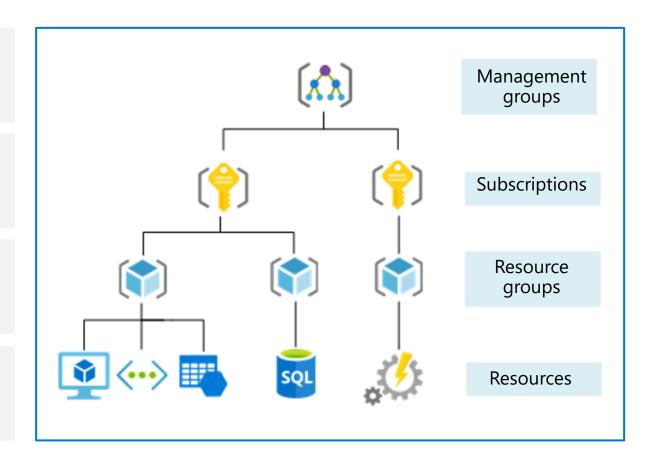
## **Management Groups**

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

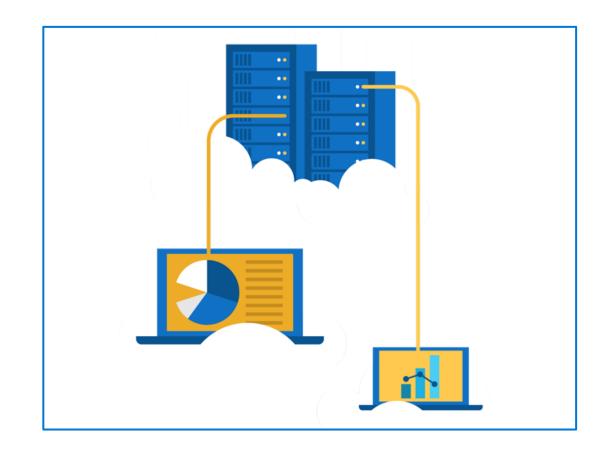
A management group tree can support up to six levels of depth

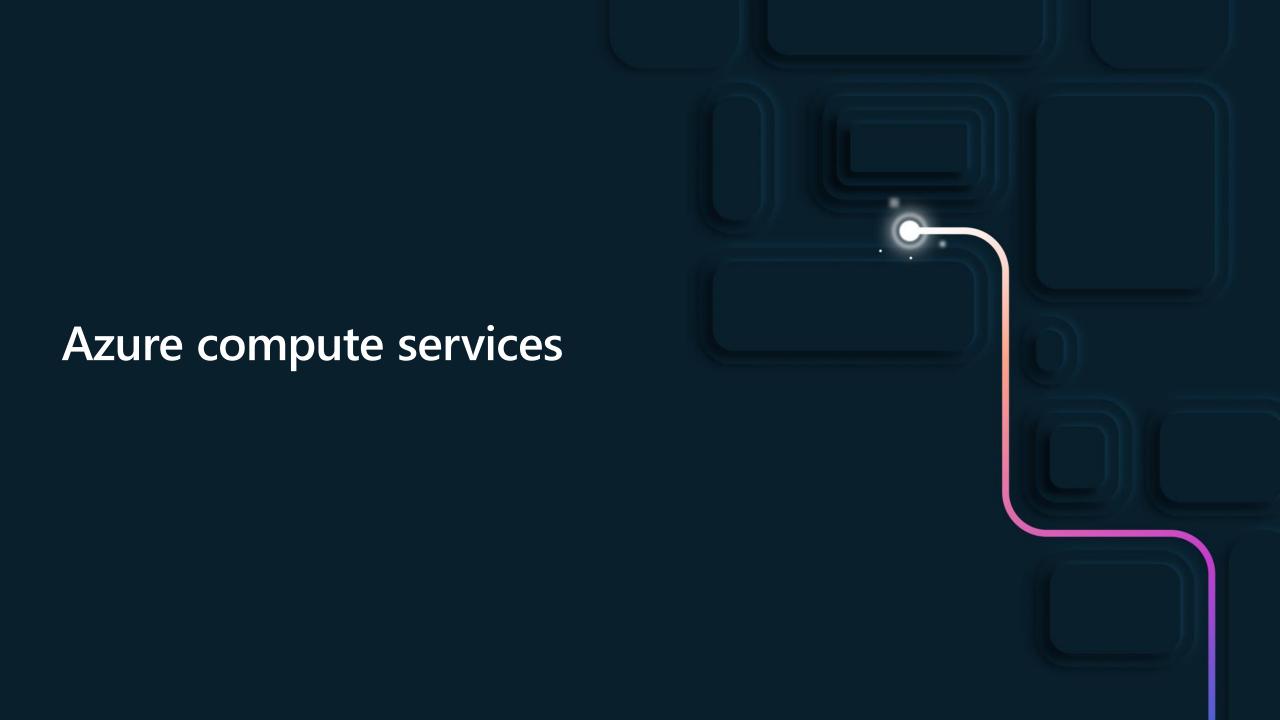


#### Exercise – Create an Azure resource

Create an Azure resource, monitor the resource group for needed resources being created in the same group.

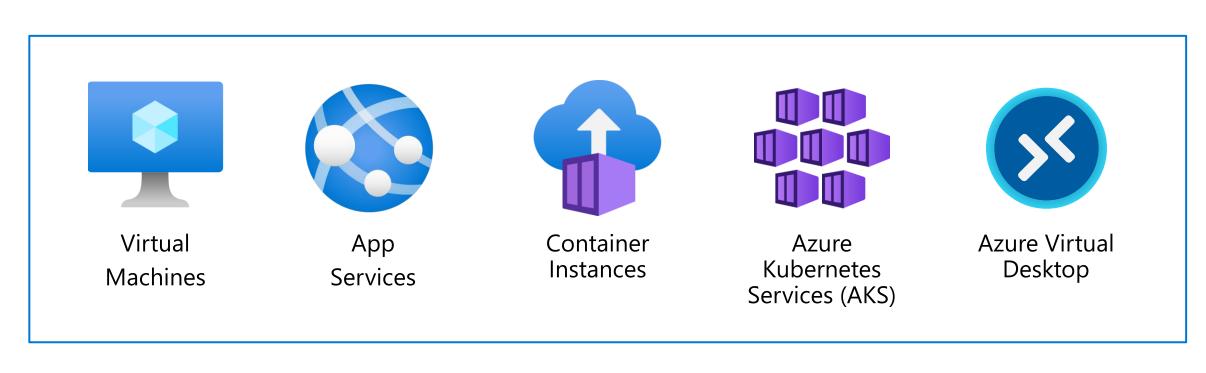
- 1. Create a virtual machine.
- 2. Monitor the resource group.





## Azure compute services

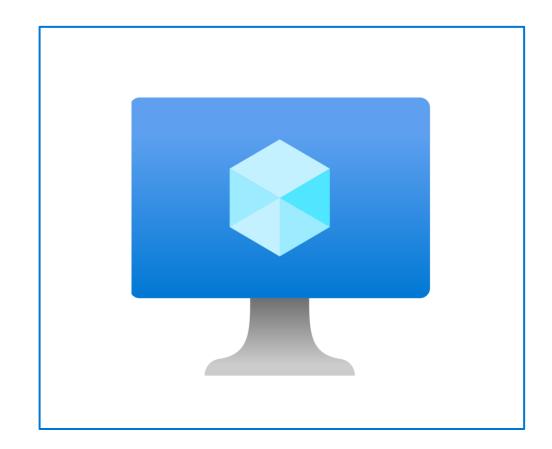
Azure **compute** is an on-demand computing service that provides computing resources such as disks, processors, memory, networking, and operating systems.



#### **Azure virtual machines**

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

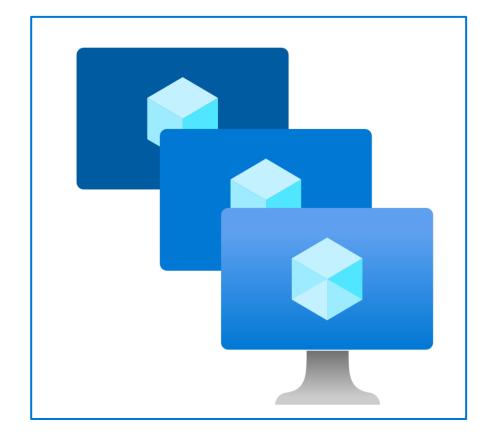
- Includes virtual processor, memory, storage, and networking.
- laaS offering that provides total control and customization.



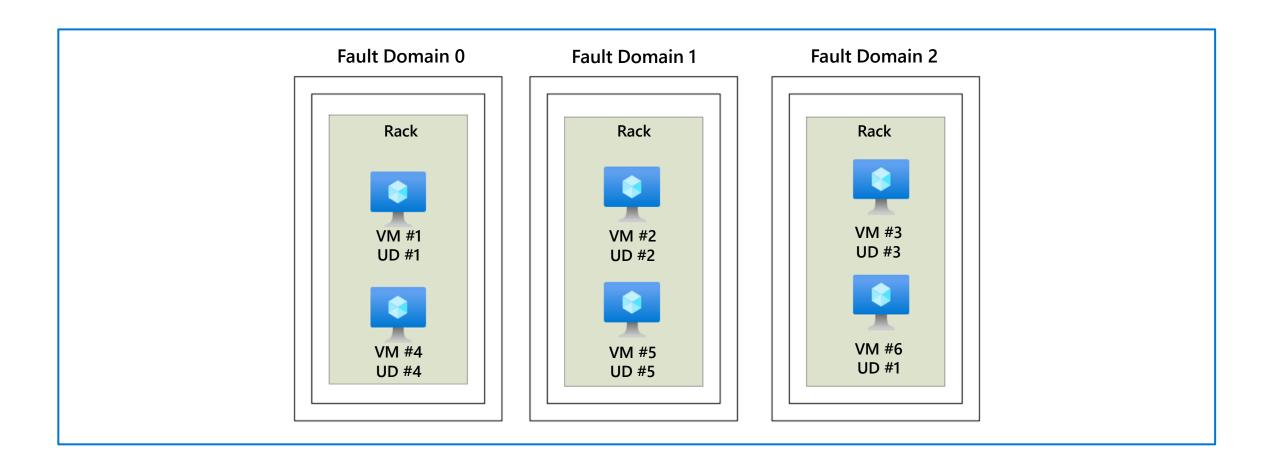
#### VM scale sets

Scale sets provide a load-balanced opportunity to automatically scale resources.

- Scale out when resource needs increase.
- Scale in when resource needs are lower.



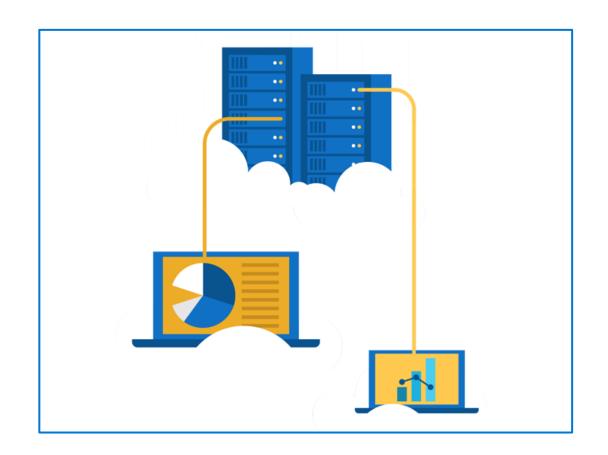
# VM availability sets



#### Exercise – Create a Virtual Machine

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

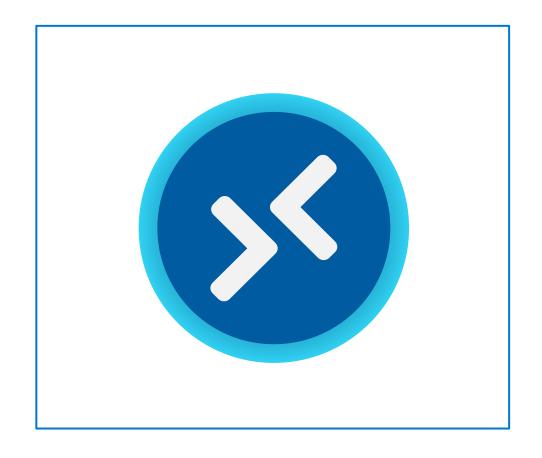
- Create the virtual machine.
- 2. Install the web server package.



## **Azure Virtual Desktop**

**Azure 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.
- 2. Reduce risk of resource being left behind.
- True multi-session deployments.



#### **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.

#### **Azure Functions**

#### **Azure Functions**



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

## Comparing Azure compute options

#### Virtual machines

Cloud based server that supports either Windows or Linux environments.

Useful for lift-and-shift migrations to the cloud.

Complete operating system package, including the host operating system.

#### Virtual Desktop

Provides a cloud based personal computer Windows desktop experience.

Dedicated applications to connect and use, or accessible from any modern browser.

Multi-client login allows multiple users to log into the same machine at the same time.

#### **Containers**

Lightweight, miniature environment well suited for running microservices.

Designed for scalability and resiliency through orchestration.

Applications and services are packaged in a container that sits ontop of the host operating system. Multiple containers can sit on one host OS.

### **Azure App Services**



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

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

#### Module 02 Review

- Physical and management infrastructure of Microsoft Azure
- Azure virtual machines
- Azure container services
- Azure compute service comparison



# **Azure Fundamentals**

Azure networking



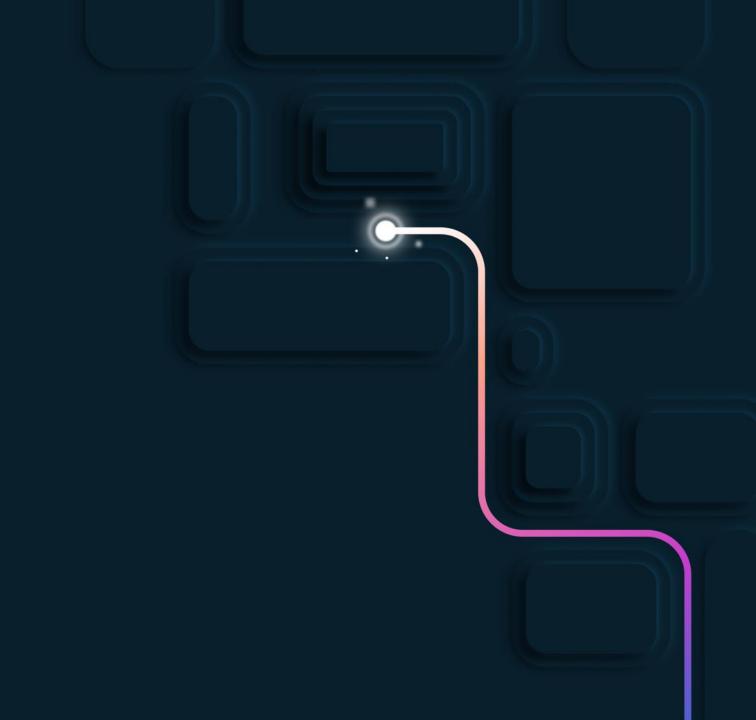
#### **Outline**

You will learn the following concepts:

- Networking
  - Virtual networking
  - Virtual private network gateway
  - o Azure ExpressRoute
  - o Azure DNS



# Azure networking



## Azure networking services



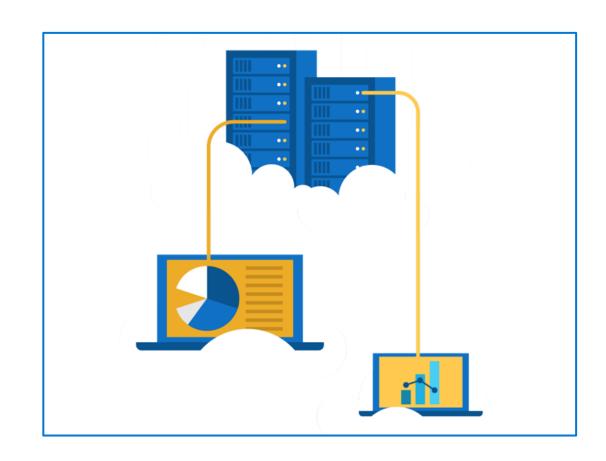
**Azure Virtual Network (VNet)** enables Azure resources to communicate with each other, the internet, and on-premises networks.

- Public endpoints, accessible from anywhere on the internet
- Private endpoints, accessible only from within your network
- Virtual subnets, segment your network to suit your needs
- Network peering, connect your private networks directly together

## Demonstration – Configure network access

# Configure public access to the virtual machine created earlier.

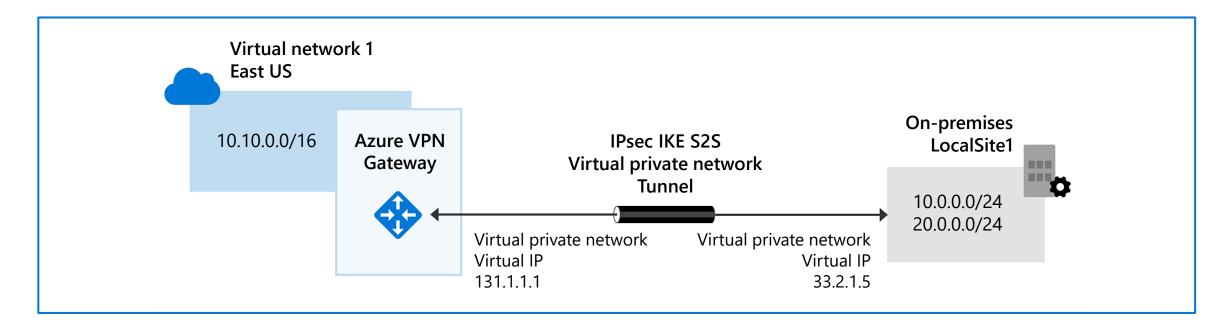
- 1. Verify currently open ports
- 2. Create a network security group
- 3. Configure HTTP access (port 80)
- 4. Test the connection



## **Azure Virtual Private Network Gateway**



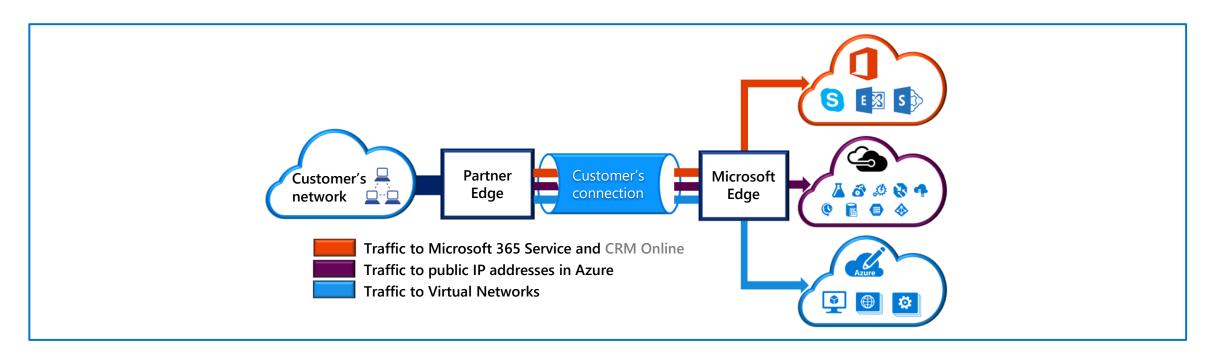
Virtual Private Network Gateway (VPN) is used to send encrypted traffic between an Azure virtual network and an on-premises location over the public internet.



### **Azure ExpressRoute**



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



#### **Azure DNS**





**Reliability and performance** by leveraging a global network of DNS name servers using Anycast networking



**Azure DNS security** is based on Azure resource manager, enabling role-based access control and monitoring and logging



Ease of use for managing your Azure and external resources with a single DNS service



**Customizable virtual networks** allow you to use private, fully customized domain names in your private virtual networks



Alias records supports alias record sets to point directly to an Azure resource.

#### Module 03 Review

- Virtual networking
- Virtual private network gateway
- Azure ExpressRoute
- Azure DNS



# **Azure Fundamentals**

Azure storage



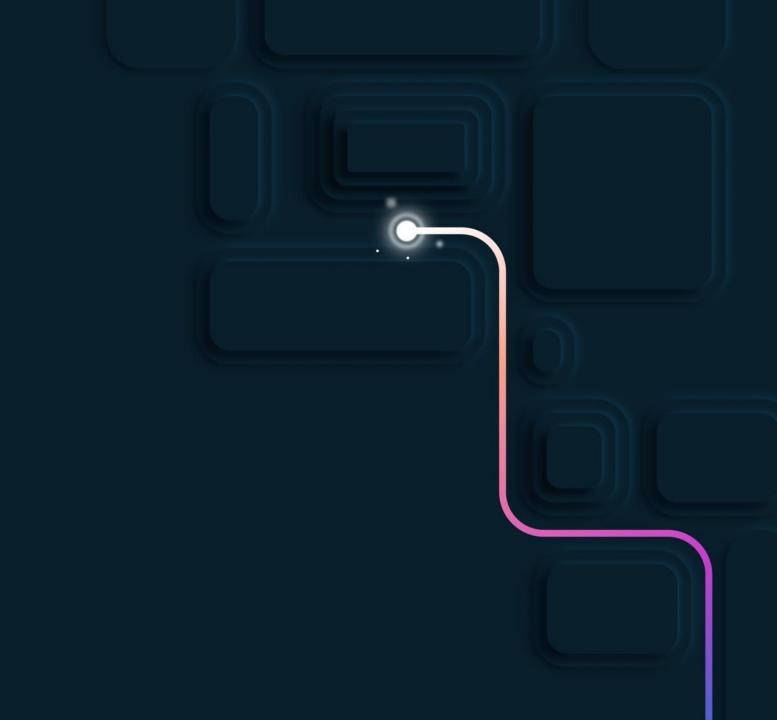
## **Outline**

You will learn the following concepts:

- Storage
  - Storage services
  - Redundancy options
  - File management and migration



Storage



### Storage accounts

- Must have a globally unique name
- Provide over-the-internet access worldwide
- Determine storage services and redundancy options



# Storage redundancy

Redundancy configuration	Deployment	Durability
Locally redundant storage (LRS)	Single datacenter in the primary region	11 nines
Zone-redundant storage (ZRS)	Three availability zones in the primary region	12 nines
Geo-redundant storage (GRS)	Single datacenter in the primary and secondary region	16 nines
Geo-zone-redundant-storage (GZRS)	Three availability zones in the primary region and a single datacenter in secondary region	16 nines

## Storage redundancy

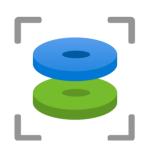
**REGION 1 REGION 2** Datacenter 1 Datacenter 2 Datacenter 3

## Azure storage services





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.

# Storage service public endpoints

Storage service	Public endpoint	
Blob Storage	https:// <storage-account-name>.blob.core.windows.net</storage-account-name>	
Data Lake Storage Gen2	https:// <storage-account-name>.dfs.core.windows.net</storage-account-name>	
Azure Files	https:// <storage-account-name>.file.core.windows.net</storage-account-name>	
Queue Storage	https:// <storage-account-name>.queue.core.windows.net</storage-account-name>	
Table Storage	https:// <storage-account-name>.table.core.windows.net</storage-account-name>	

## Azure storage access tiers



Optimized for storing data that is accessed frequently



Optimized for storing data that is infrequently accessed and stored for at least 30 days



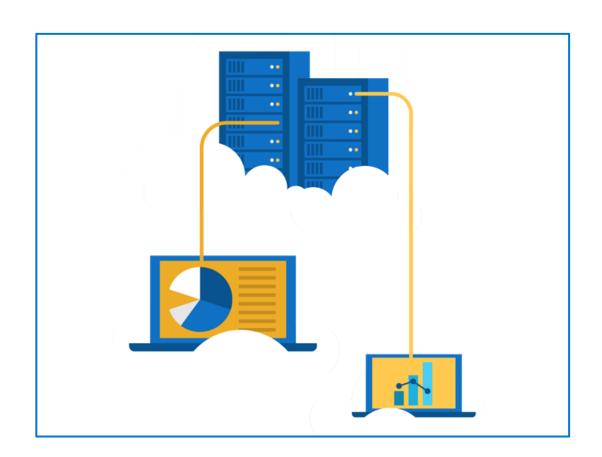
Optimized for storing data that is rarely accessed and stored for at least 180 days with flexible latency requirements

You can switch between these access tiers at any time.

## Demonstration - Create a storage blob

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

- 1. Create a storage account.
- 2. Create a blob container.
- 3. Upload and access a blob.



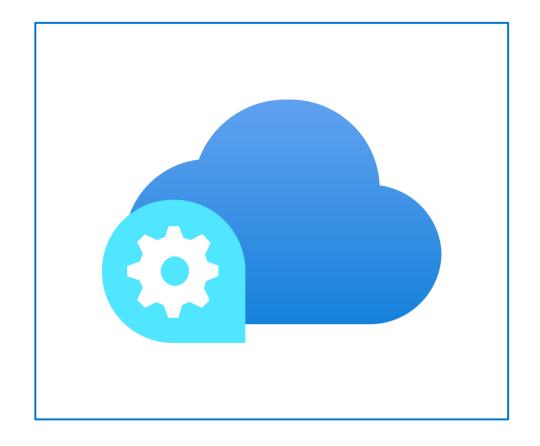
## **Azure Migrate**

- Unified migration platform
- Range of integrated and standalone tools
- Assessment and migration



#### **Azure Data Box**

- Store up to 80 terabytes of data.
- Move your disaster recovery backups to Azure.
- Protect your data in a rugged case during transit.
- Migrate data out of Azure for compliance or regulatory needs.
- Migrate data to Azure from remote locations with limited or no connectivity.



# File management options

User interface Synchronizes Azure and on premises files in a bidirectional manner
e with Windows, d Linux  Cloud tiering keeps frequently accessed files local, while freeing up space
py to handle file  Rapid reprovisioning of failed local server (install and resync)
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### Module 04 Review

- Storage services
- Redundancy options
- File management and migration



## **Azure Fundamentals**

Azure identity, access, and security Azure cost management



### **Outline**

You will learn the following concepts:

- Identity, access, and security
  - Directory services
  - Authentication methods
  - Security models
- Cost management
  - Cost and pricing calculators
  - Cost management and tags





## **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.



## Azure Active Directory Domain Services (Azure AD DS)

- Gain the benefit of cloud-based domain services without managing domain controllers
- Run legacy applications (that can't use modern auth standards) in the cloud
- Automatically sync from Azure AD

### **Compare Authentication and Authorization**

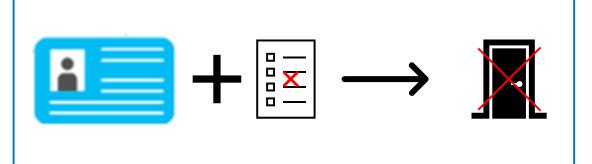
#### **Authentication**

- 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.

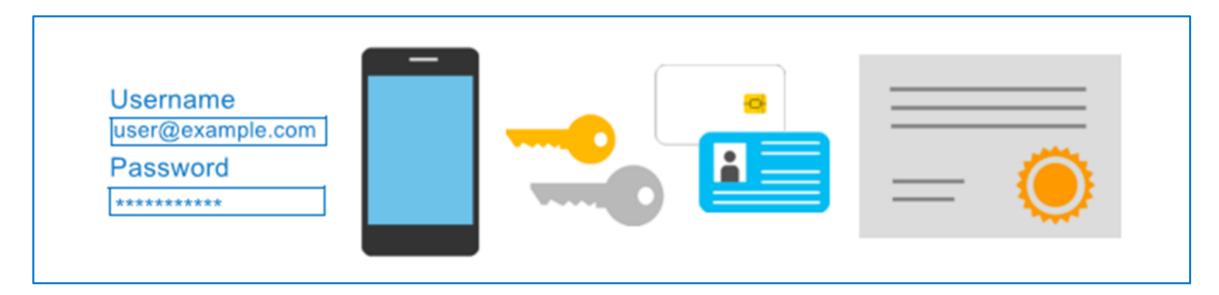




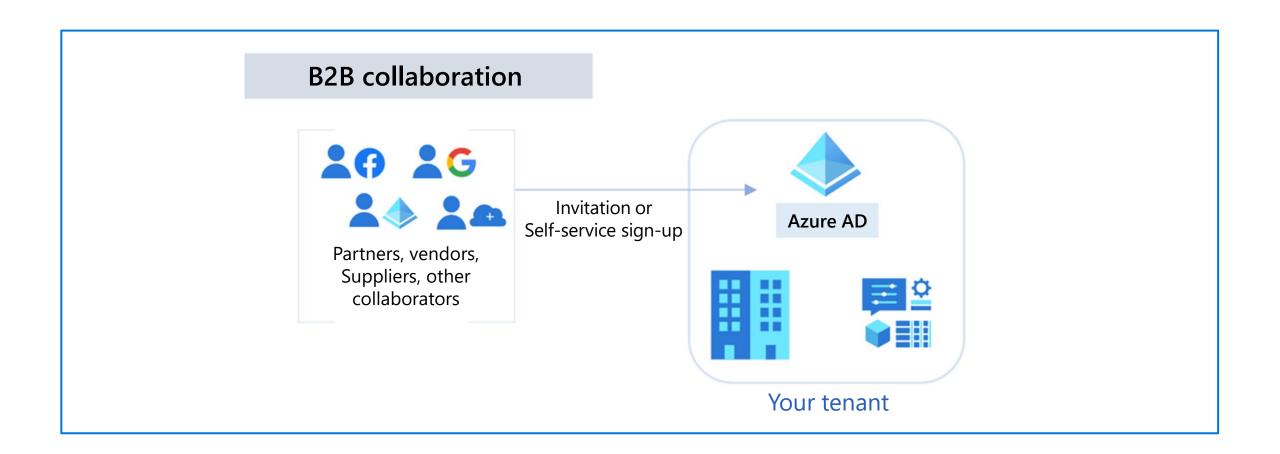
#### **Azure Multi-Factor Authentication**

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

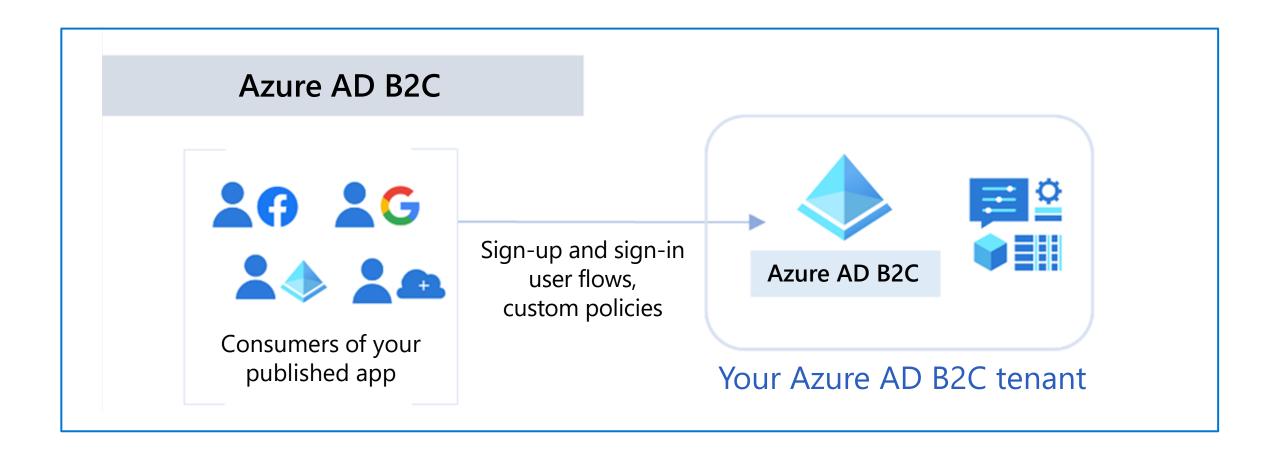
• Something you know  $\leftarrow \rightarrow$  Something you possess  $\leftarrow \rightarrow$  Something you are



### **External Identities B2B**



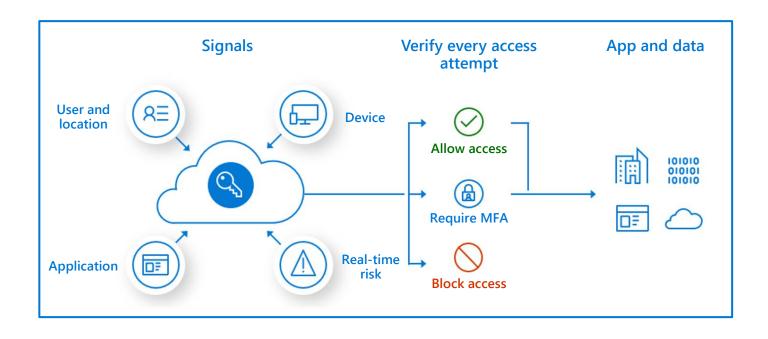
#### **External Identities B2C**



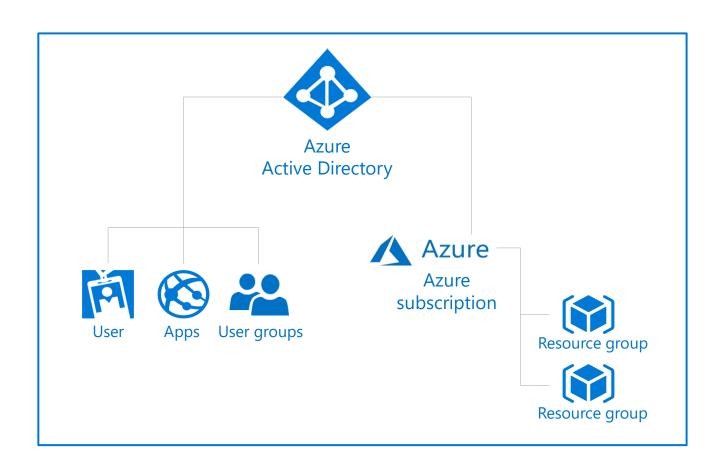
#### **Conditional Access**

**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



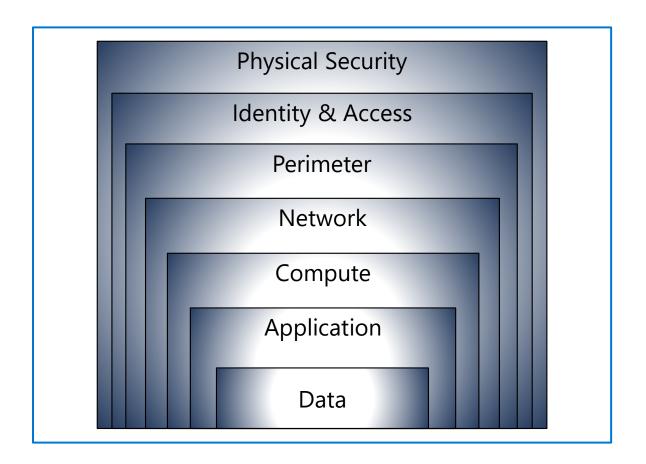
## Azure role-based access control (Azure RBAC)



- 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

## Defense in depth

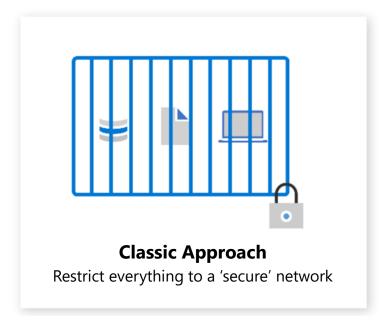
- A layered approach to securing computer systems
- Provides multiple levels of protection
- Attacks against one layer are isolated from subsequent layers



#### **Zero Trust**

#### Secure assets where they are with Zero Trust

Simplify security and make it more effective

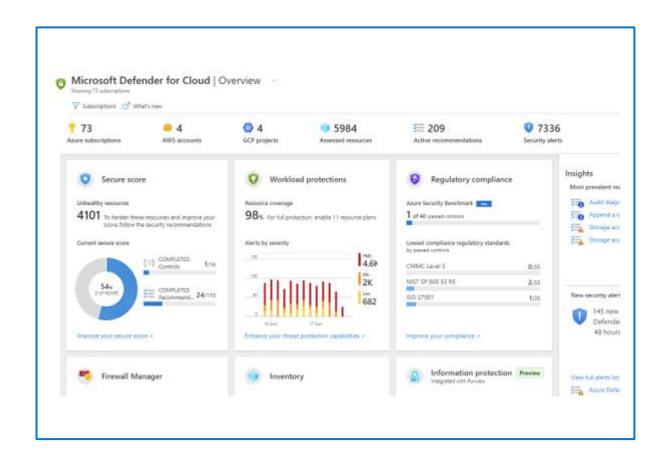




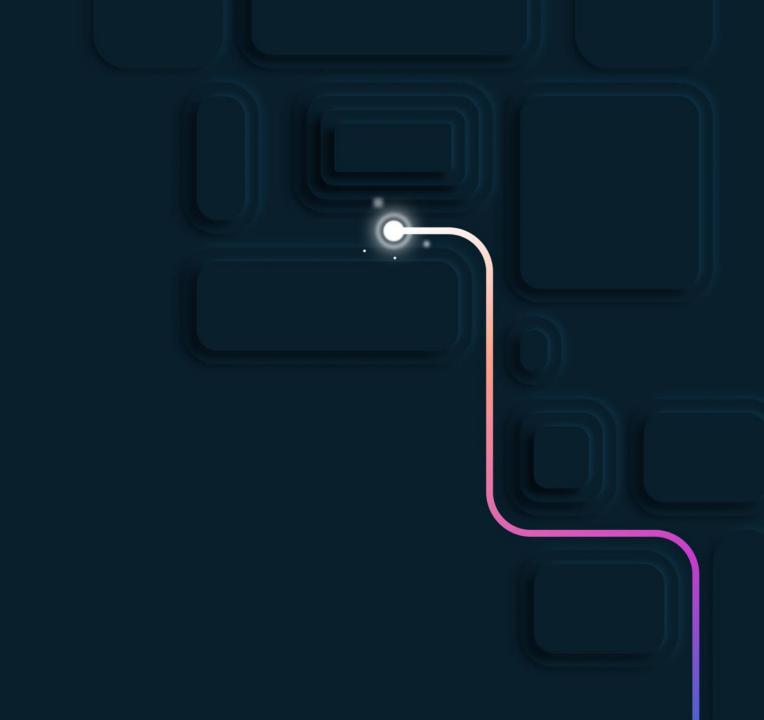
#### Microsoft Defender for Cloud

Microsoft Defender for Cloud 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



Cost management



## Factors affecting costs (part 1)

These are some of the factors affecting costs:

#### 1) Resource Type

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.

#### 2) Consumption

With a pay-as-you-go model, consumption is one of the biggest drivers of costs.

#### 3) Maintenance

Monitoring your Azure footprint and maintaining your environment can help you identify and mitigate costs that aren't necessary, such as shutting down under used virtual machines.

## Factors affecting costs (part 2)

These are some of the factors affecting costs:

#### 4) Geography

The same resource type can cost different amounts depending on the geographic area, so geography has an impact on Azure costs.

#### 5) Network traffic

While some inbound data transfers are free, the cost for outbound data or data between Azure resources is impacted by Billing zones.

#### 6) Subscription

The type and configuration of your subscription can also impact your cost. For example, the free trial lets you explore some Azure resources for free.

## **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.

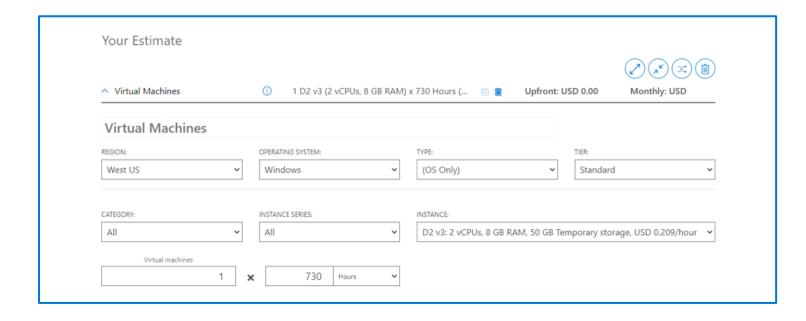
- Open source container platforms.
- Virtual machine and database images.
- Application build and deployment software.
- Developer tools.
- And much more, with 10,000+ listings!



## **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:

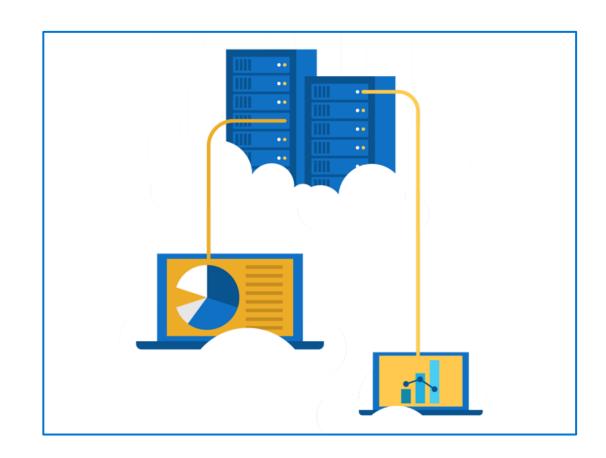
- Region
- Tier
- Billing options
- Support options
- Programs and offers
- Azure dev/test pricing



## Demonstration - Use the Azure Pricing Calculator

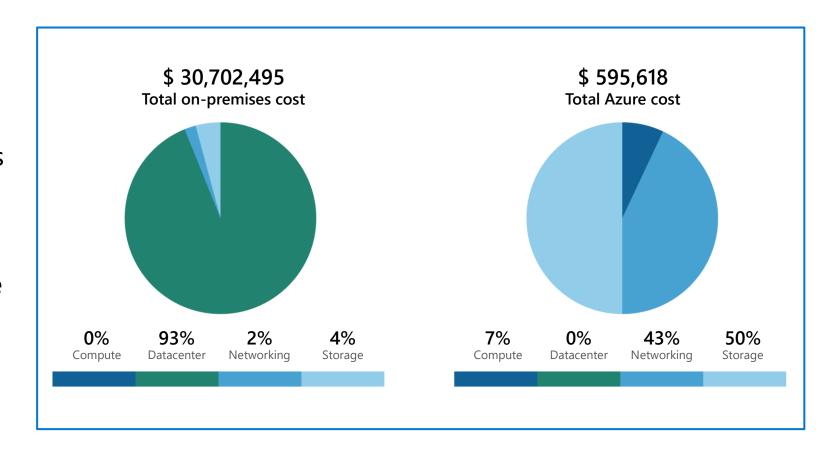
Use the Azure Pricing Calculator to generate a cost estimate for an Azure virtual machine and related network resources.

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



## **Total Cost of Ownership Calculator**

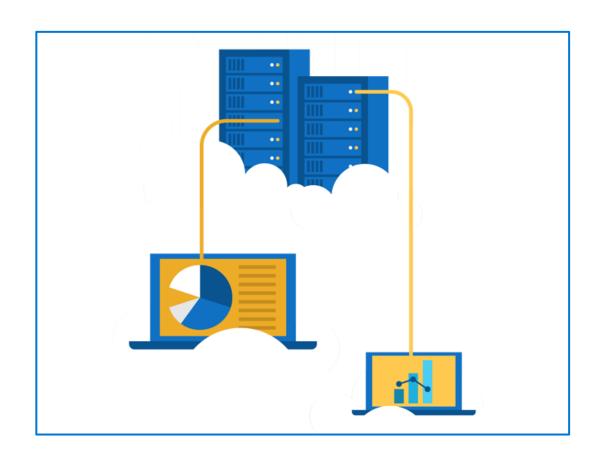
- A tool to estimate cost savings you can realize by migrating to Azure.
- A report compares the costs of on-premises infrastructures with the costs of using Azure products and services in the cloud.



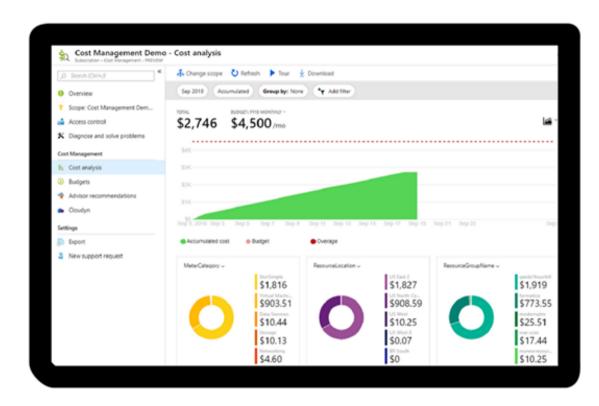
#### **Demonstration - Use the Azure TCO Calculator**

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.



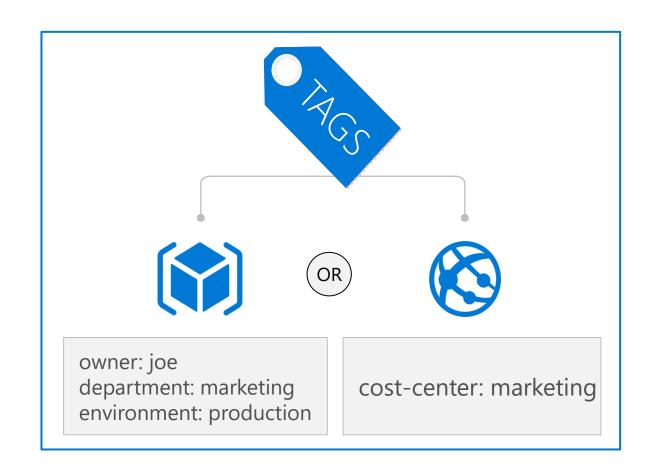
## **Azure Cost Management**



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

### **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.



#### Module 05 Review

- Directory services
- Authentication methods
- Security models
- Cost and pricing calculators
- Cost management and tags
- Cost management



## **Azure Fundamentals**

Azure governance and compliance Azure resource management Azure monitoring services



#### **Outline**

#### You will learn the following concepts:

- Governance and compliance
  - o Blueprints, policies, and resource locks
  - Service Trust portal
- Resource deployment tools
  - o Portal, PowerShell, CLI, and others
  - Azure Arc and Azure Resource Manager
- Monitoring tools
  - Azure Advisor, Azure Service Health, and Azure Monitor

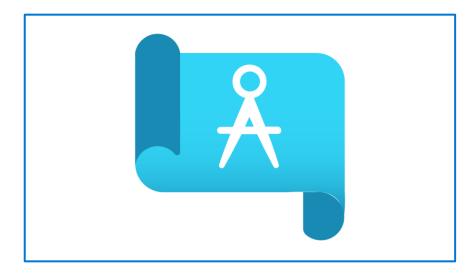




## **Azure Blueprints**

**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.

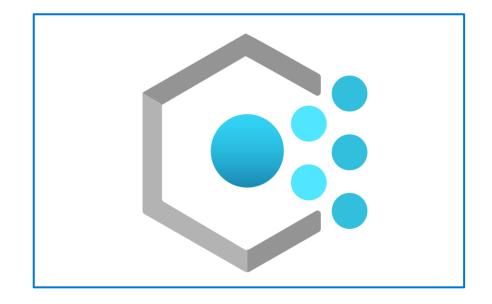
- Role Assignments
- Policy Assignments
- Azure Resource Manager Templates
- Resource Groups



## **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.



#### Resource locks

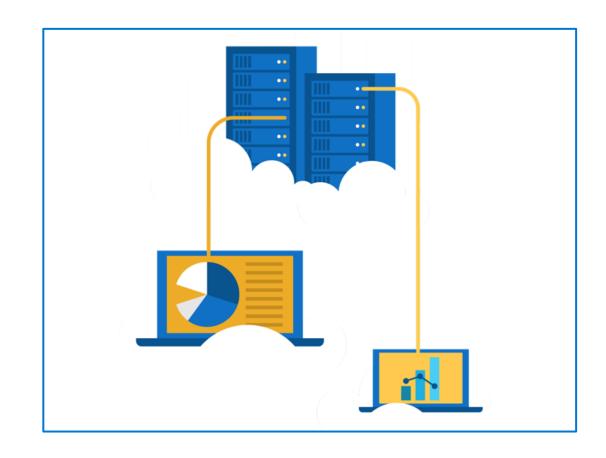
- Protect your Azure resources from accidental deletion or modification.
- Manage locks at subscription, resource group, or individual resource levels within Azure Portal.

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

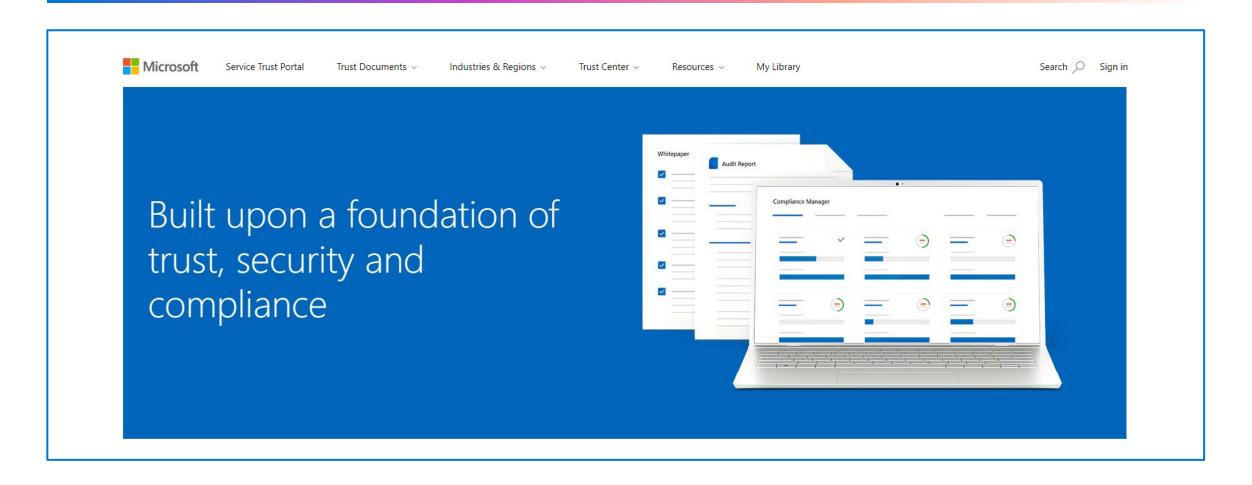
## **Demonstration - Manage Resource Locks**

# Create a resource add a lock and modification.

- Create a resource.
- 2. Add a ReadOnly resource lock to prevent resource modification.
- 3. Update lock and retest.
- Remove the resource lock.
- Delete the resource.

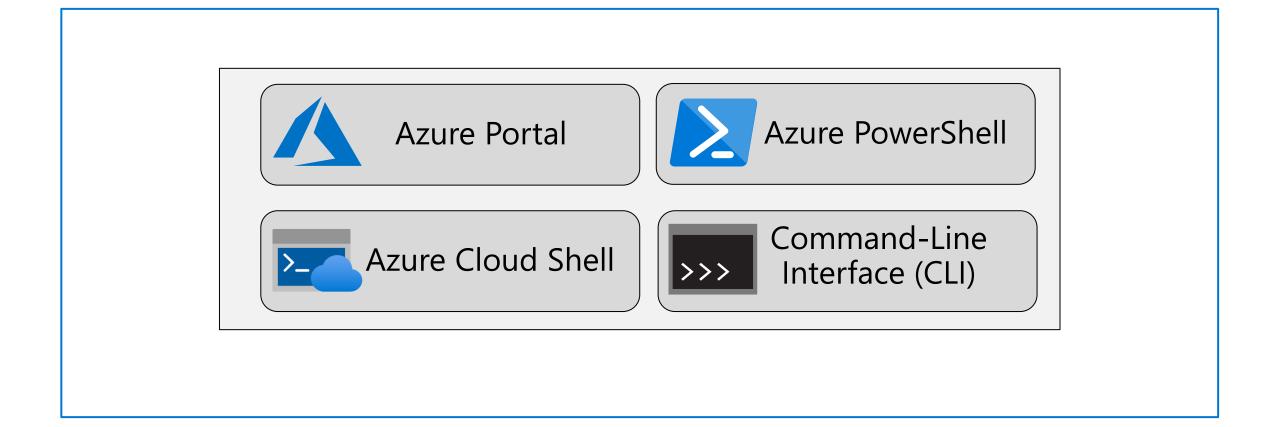


## **Service Trust portal**

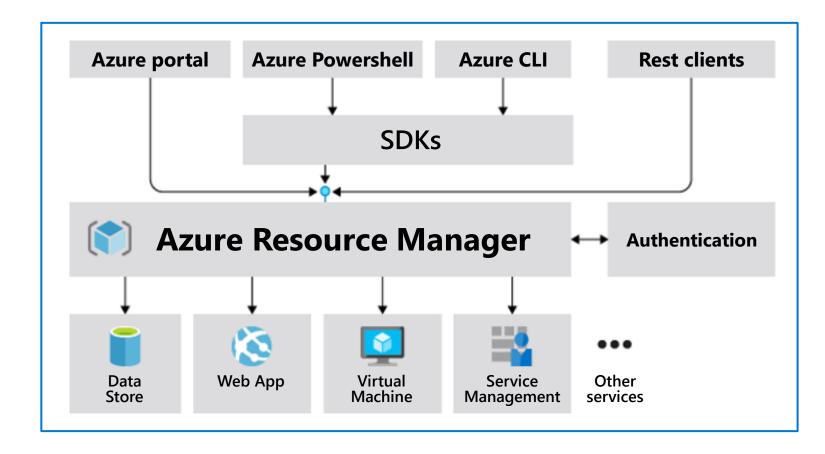




## Tools for interacting with Azure



### **Azure Resource Manager**

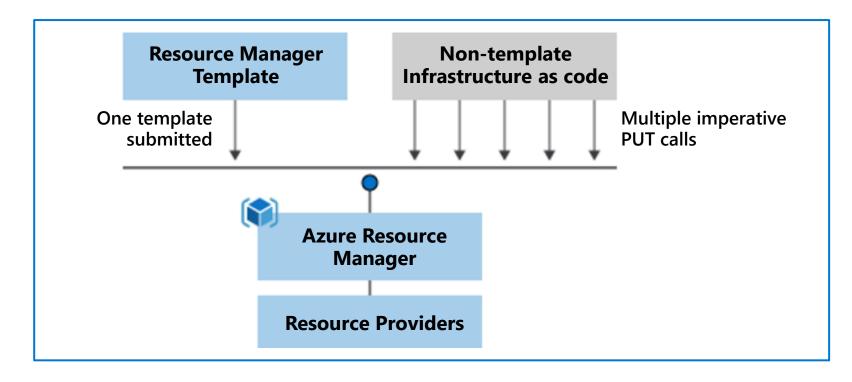


The Azure Resource
Manager (ARM) provides a
management layer that
enables you to create,
update, and delete resources
in your Azure subscription.

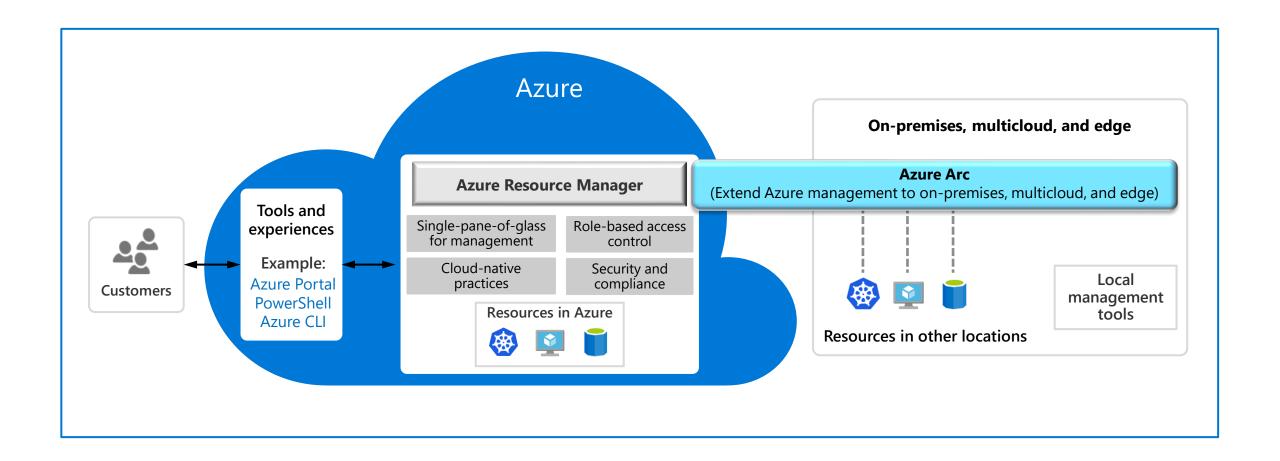
## Azure Resource Manager (ARM) templates

**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



#### **Azure Arc**



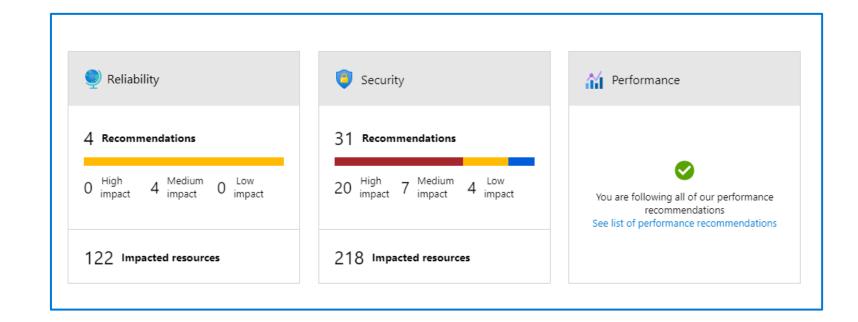


#### **Azure Advisor**



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

- Reliability
- Security
- Performance
- Cost
- Operational Excellence



#### **Azure Service Health**

Azure Service Health is a collection of services that keep you informed of general Azure status, service status that may impact you, and specific resource status that is impacting you.

**Azure Status**: global view of the health of all Azure services across all Azure regions

**Service Health**: focused view on only the services and regions that you're using. If a service is experiencing a problem in a region you're not using, it won't show up here

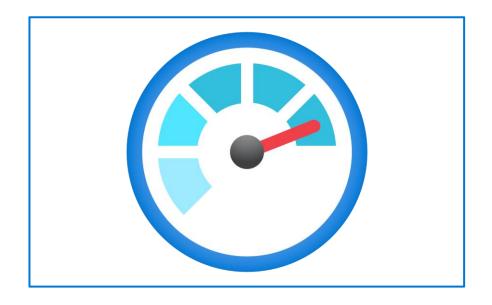
**Resource Health**: tailored view of your actual Azure resources. It provides information about the health of your individual cloud resources



#### **Azure Monitor**

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

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



### Module 06 Review

- Governance and compliance
- Resource deployment tools
- Monitoring tools



# Thank you

