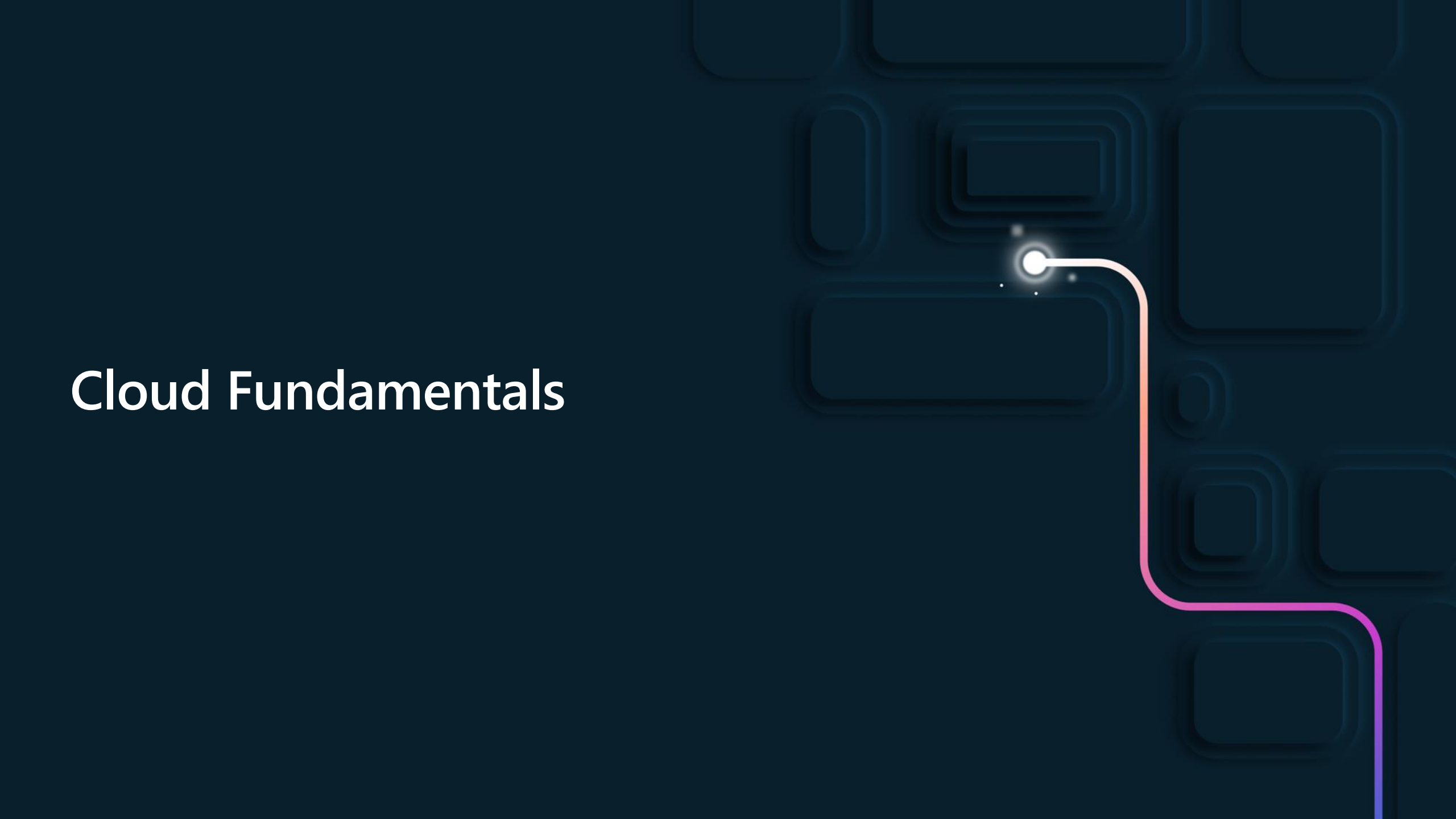
Microsoft

Microsoft Azure Virtual Training Day: Fundamentals

Agenda

Part 1	Part 2
Cloud fundamentals	**Azure storage**
Azure architecture and Azure compute services	**Azure identity, access and security and Azure cost management**
Azure networking	**Azure governance and compliance, Azure resource management, and Azure monitoring services**

Cloud Fundamentals



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Learning Objectives

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

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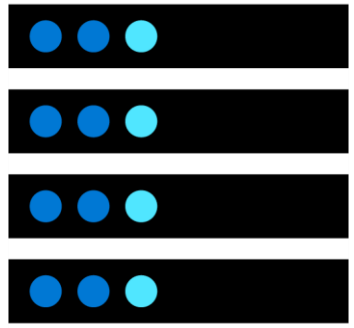
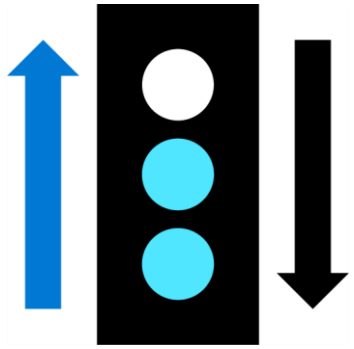
Learning Objective: Cloud Computing

What is cloud computing?

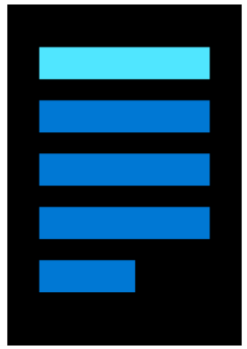
Cloud Computing is the delivery of computing services over the internet, enabling faster innovation, flexible resources, and economies of scale.



Compute



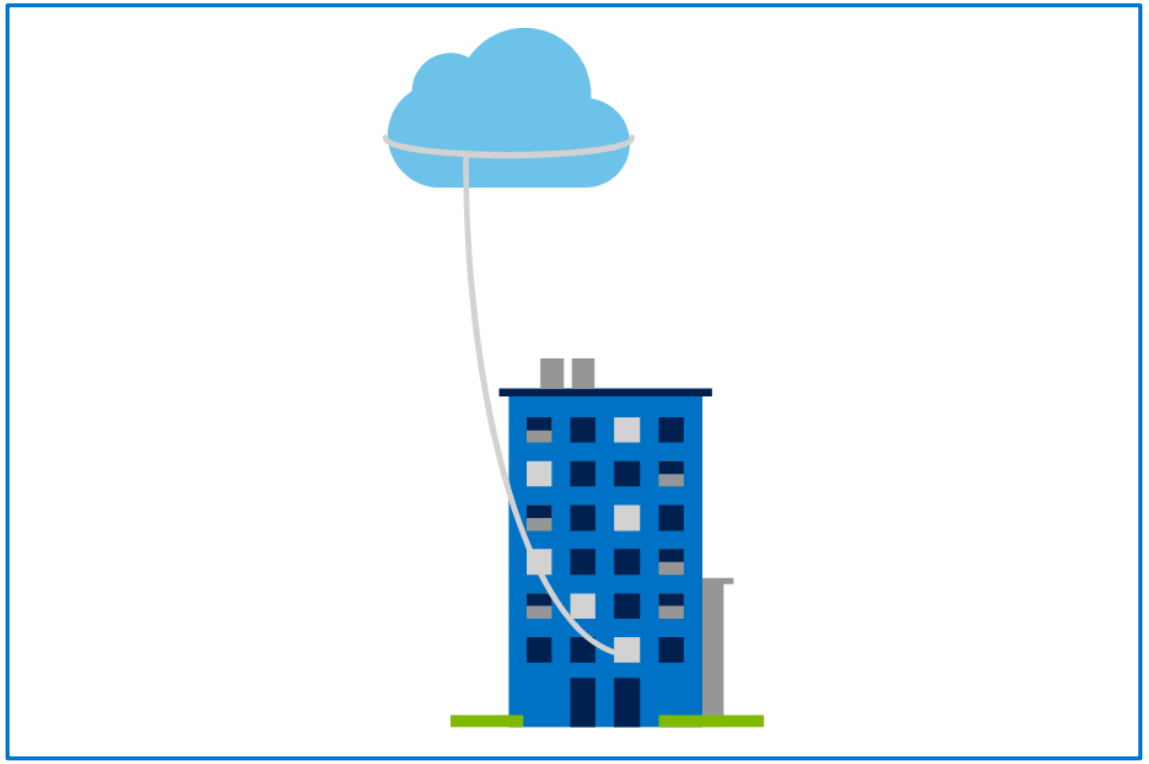
Networking



Storage

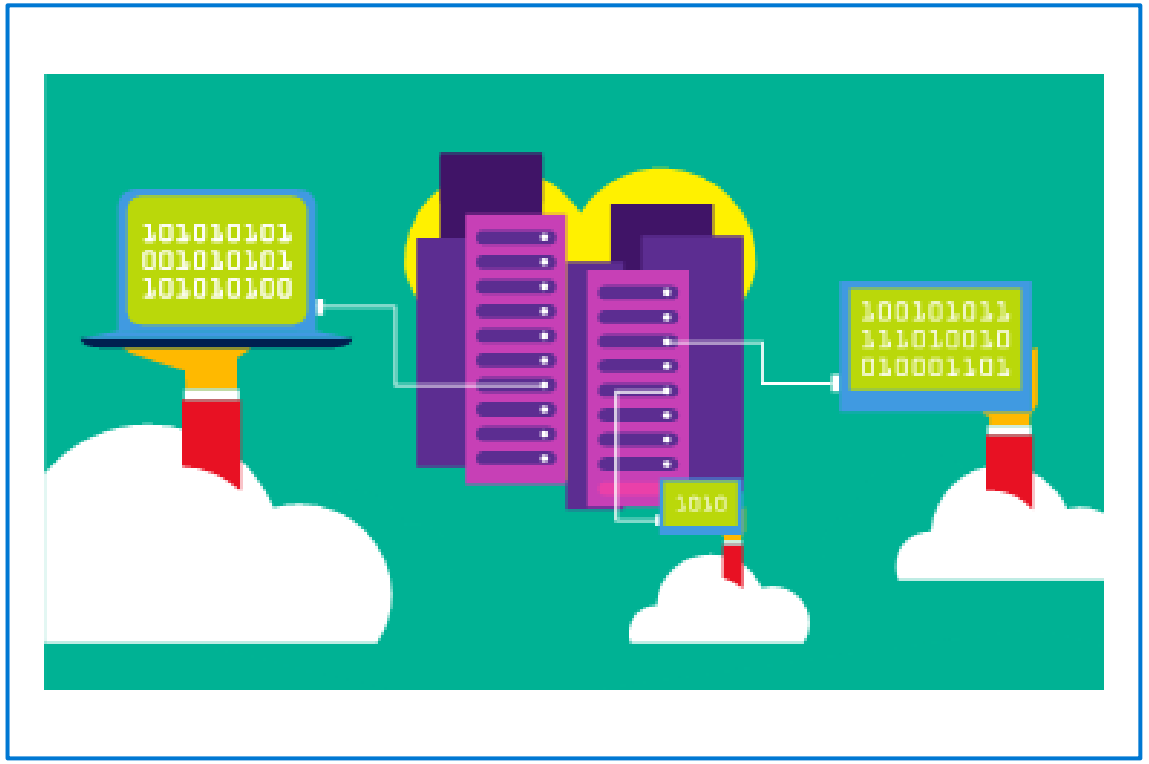
Private cloud

- 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

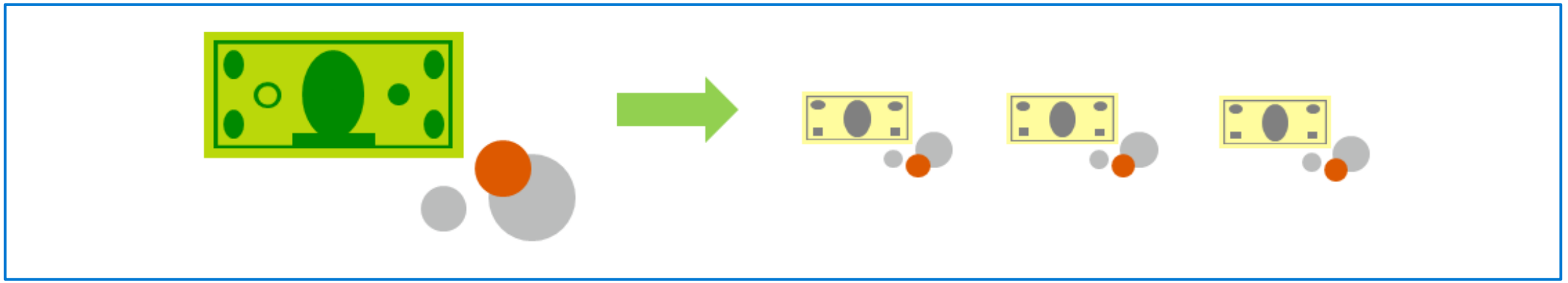
Compare CapEx vs. OpEx

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)

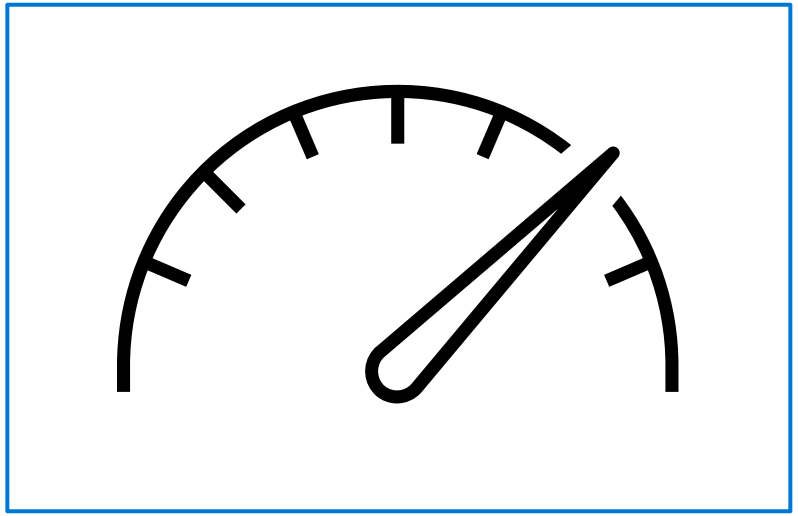
- Spend on products and services as needed, pay-as-you-go
- Get billed immediately



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



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Learning Objective: Cloud Benefits

Cloud Benefits

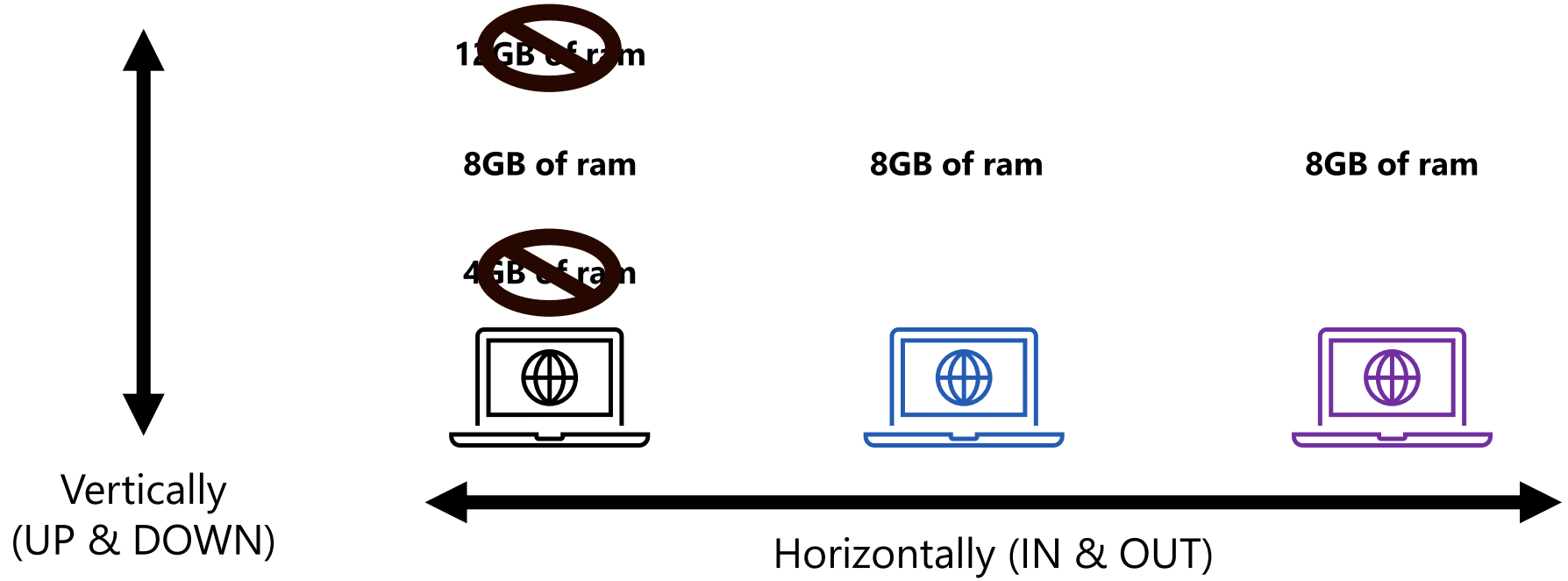
High availability

Elasticity

Scalability

Scalability and Elasticity

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



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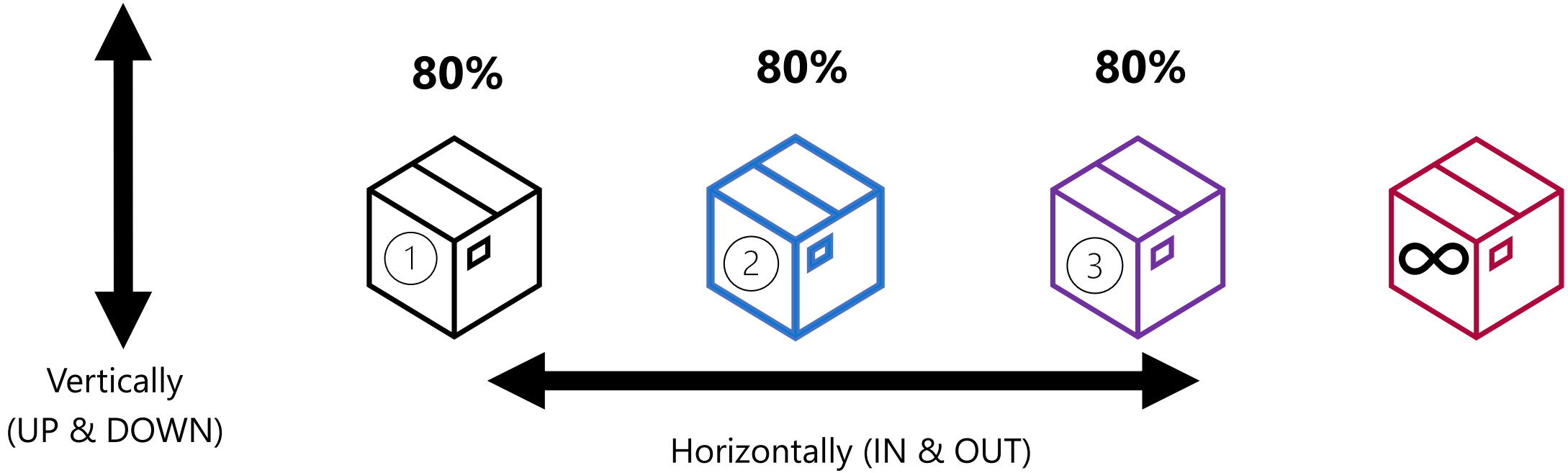

Cloud Benefits

- High availability
- Elasticity
- Scalability
- Reliability
- Predictability
- Security
- Governance
- Manageability

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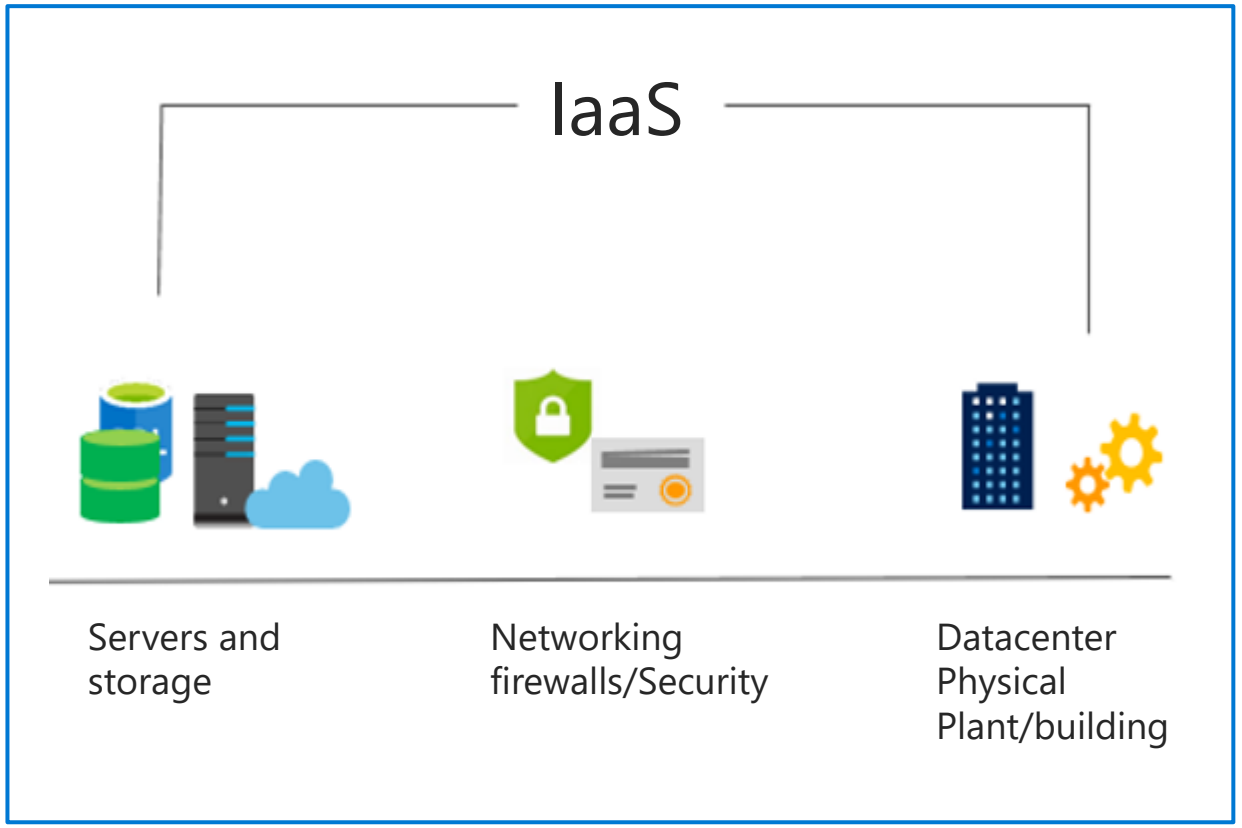
Learning Objective: Cloud Service Types

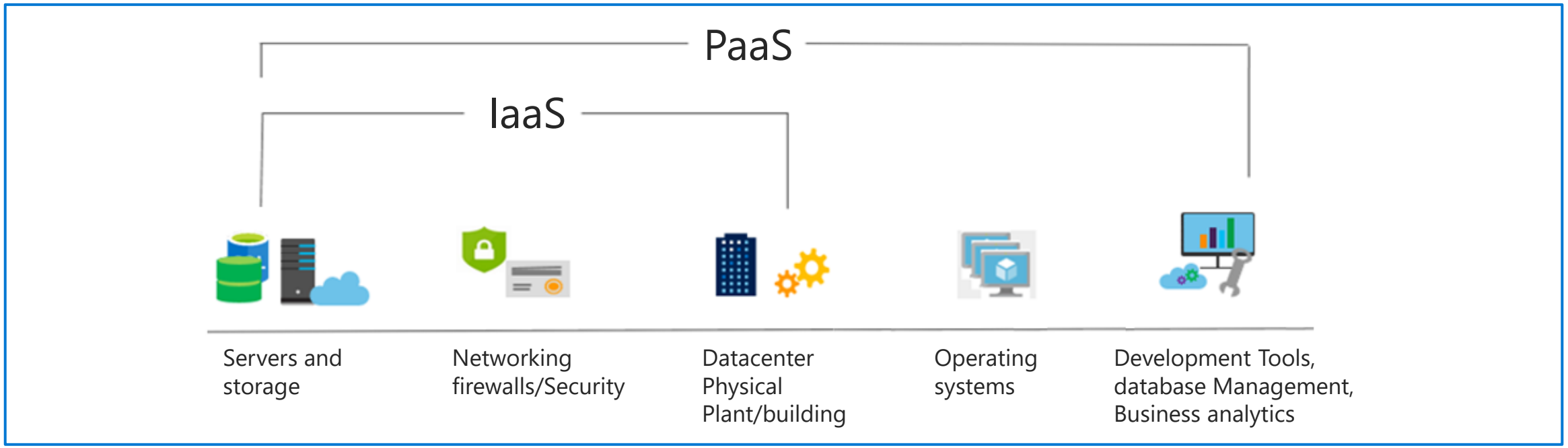
Infrastructure as a Service (IaaS)

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



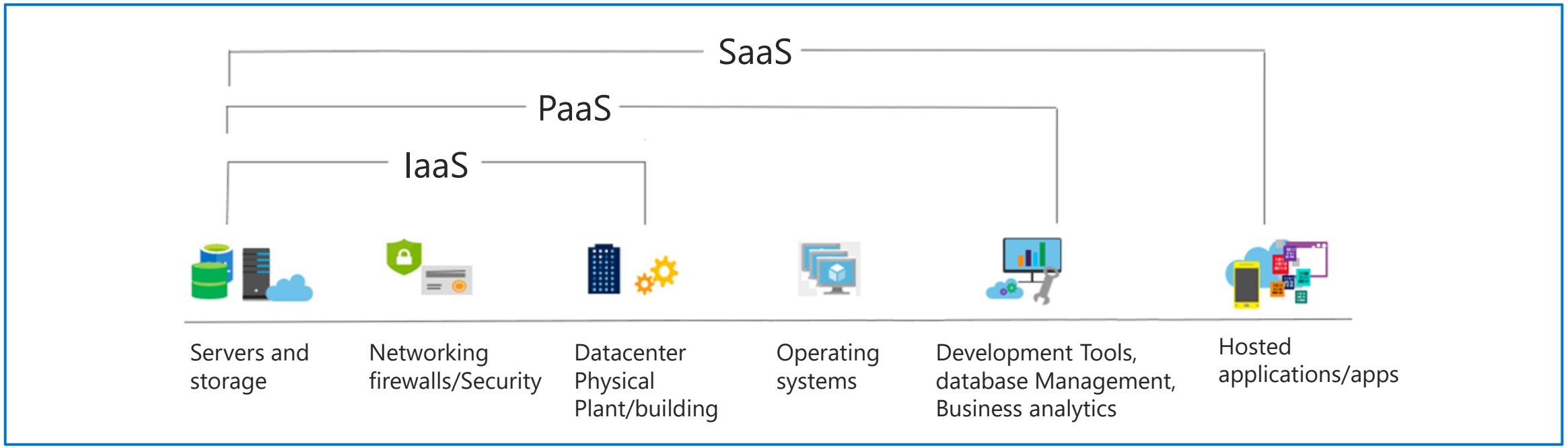
Platform as a Service (PaaS)

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



Software as a Service (SaaS)

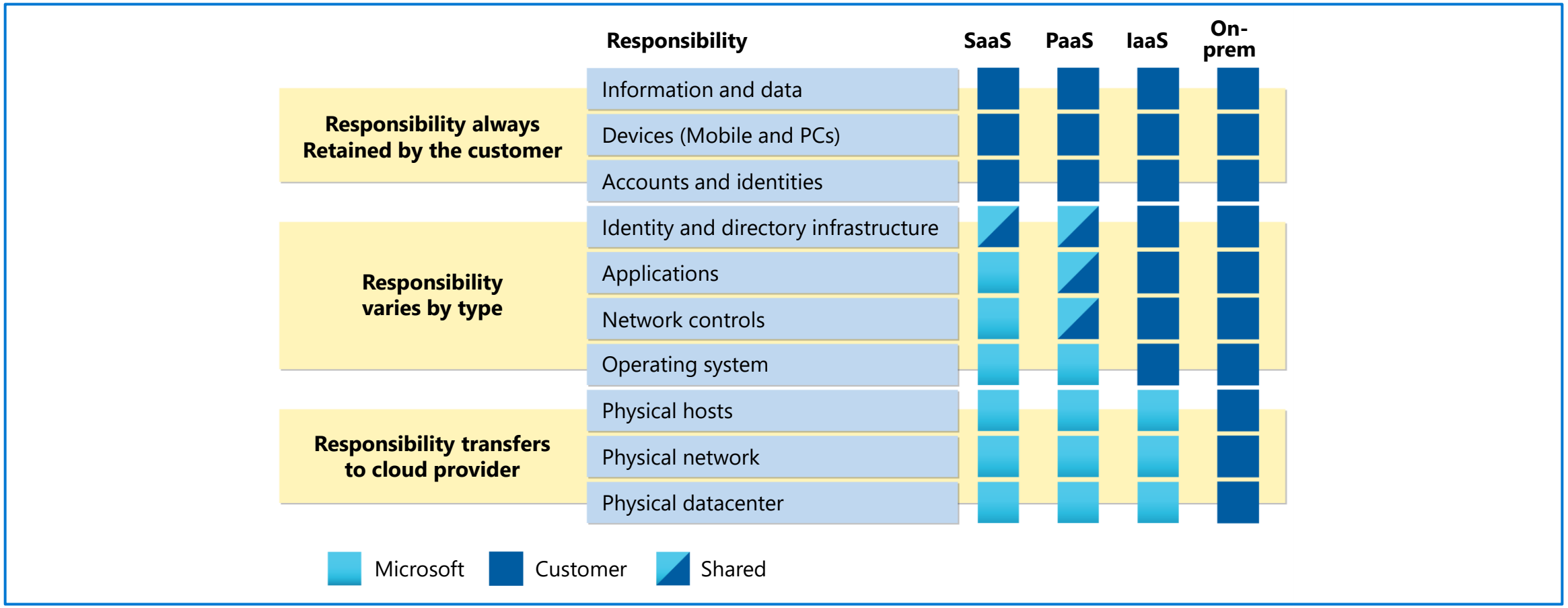
Users connect to and use cloud-based apps over the internet: for example, Microsoft Office 365, email, and calendars.



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



Session 01 Review

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

Azure architecture and Azure compute services

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Learning Objectives

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

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Learning Objective: Azure Architectural Components

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.

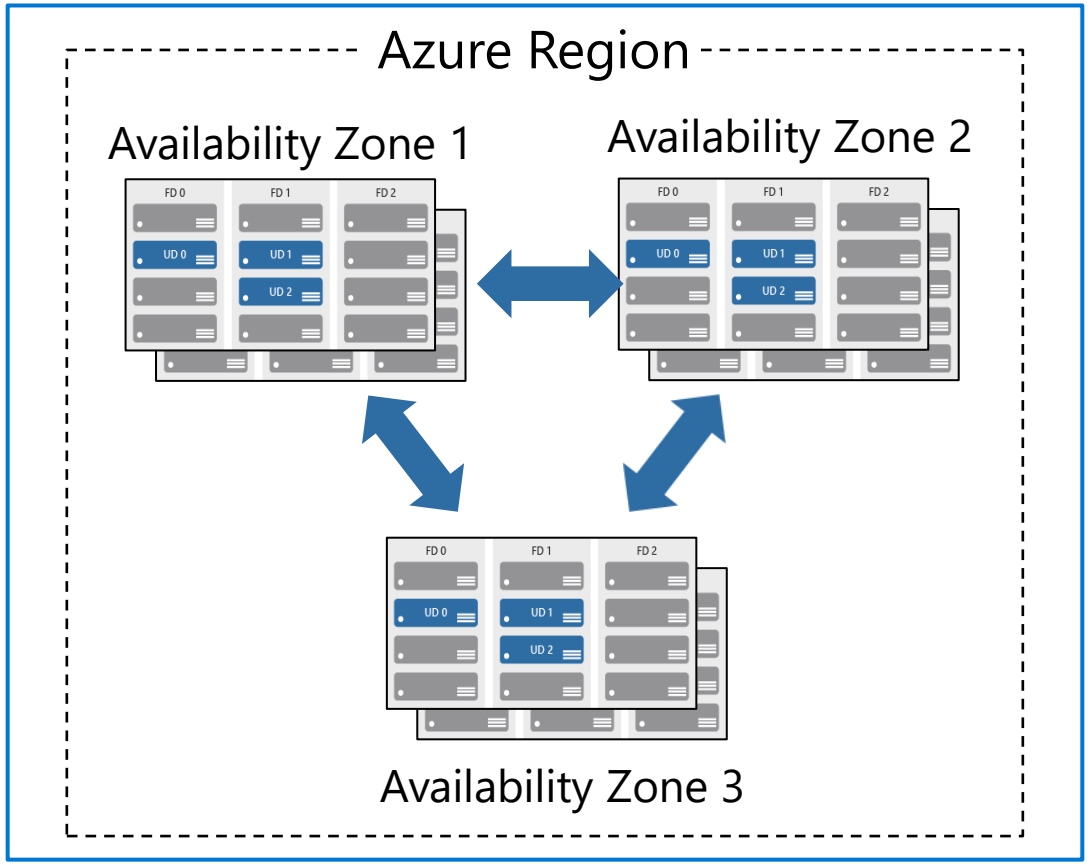
Availability zones

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

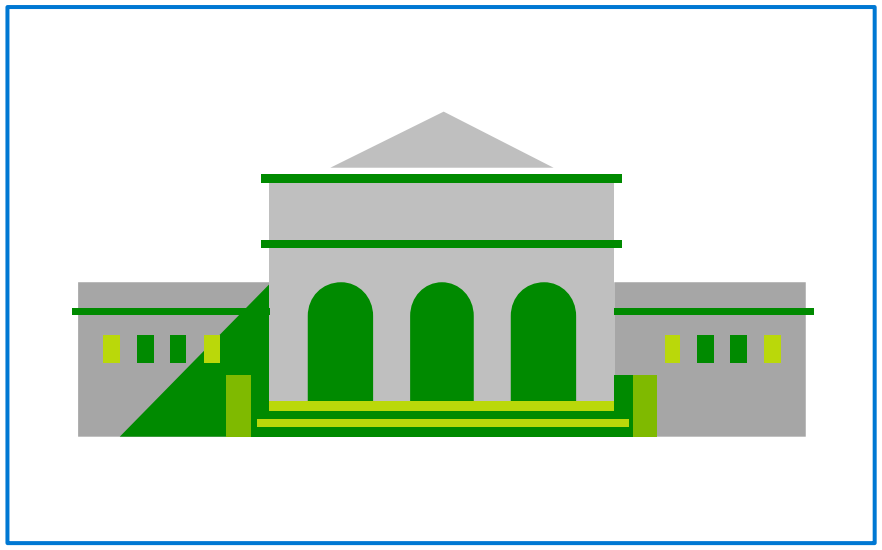
- At least 300 miles (500 kms) of separation between region pairs.
- Automatic replication for some services.
- Prioritized region recovery in the event of outage.
- Updates are rollout sequentially to minimize downtime.

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

Azure Sovereign Regions (US Government services)

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

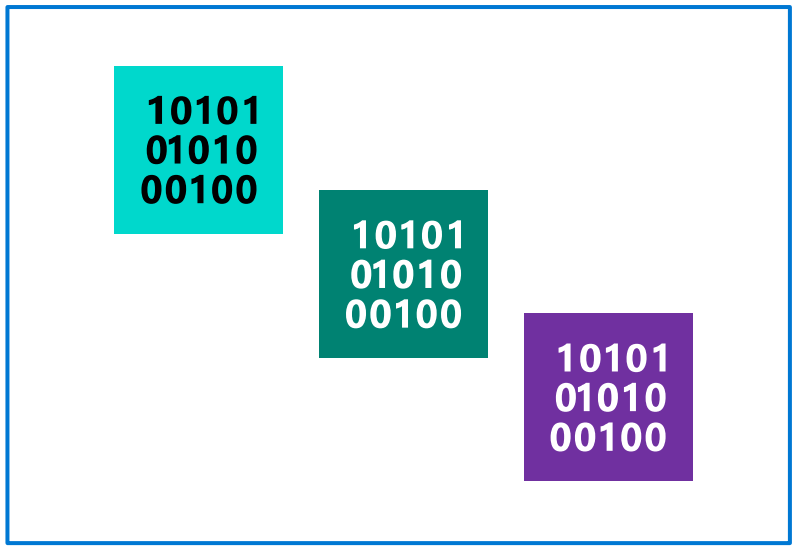


Azure Government:

- 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

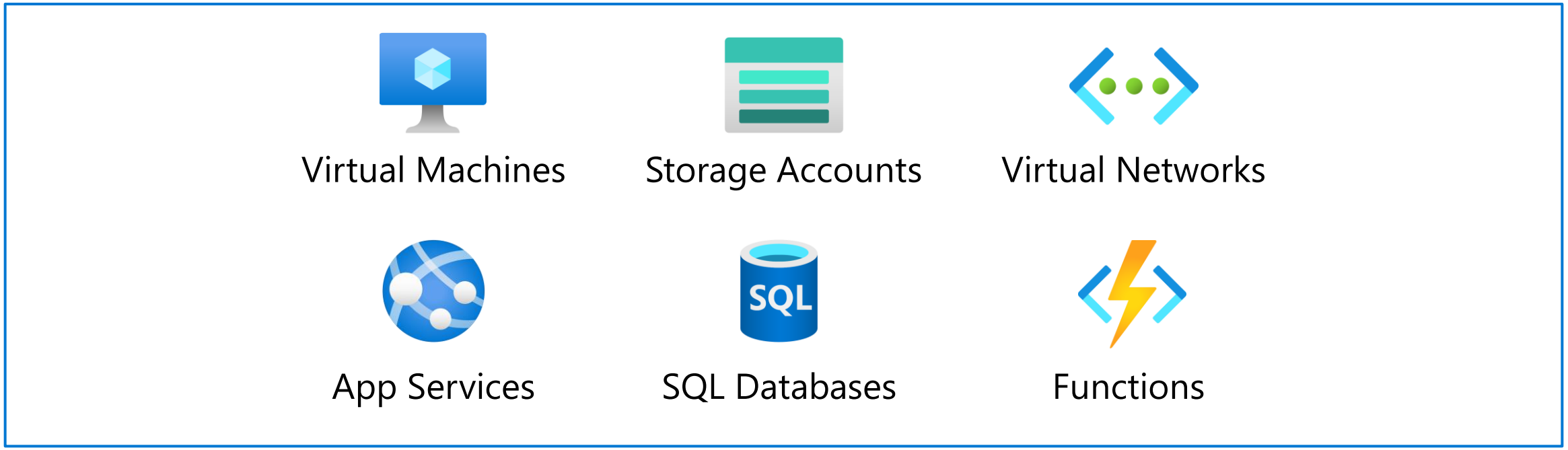
Demo

Explore the Azure global infrastructure

1. 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

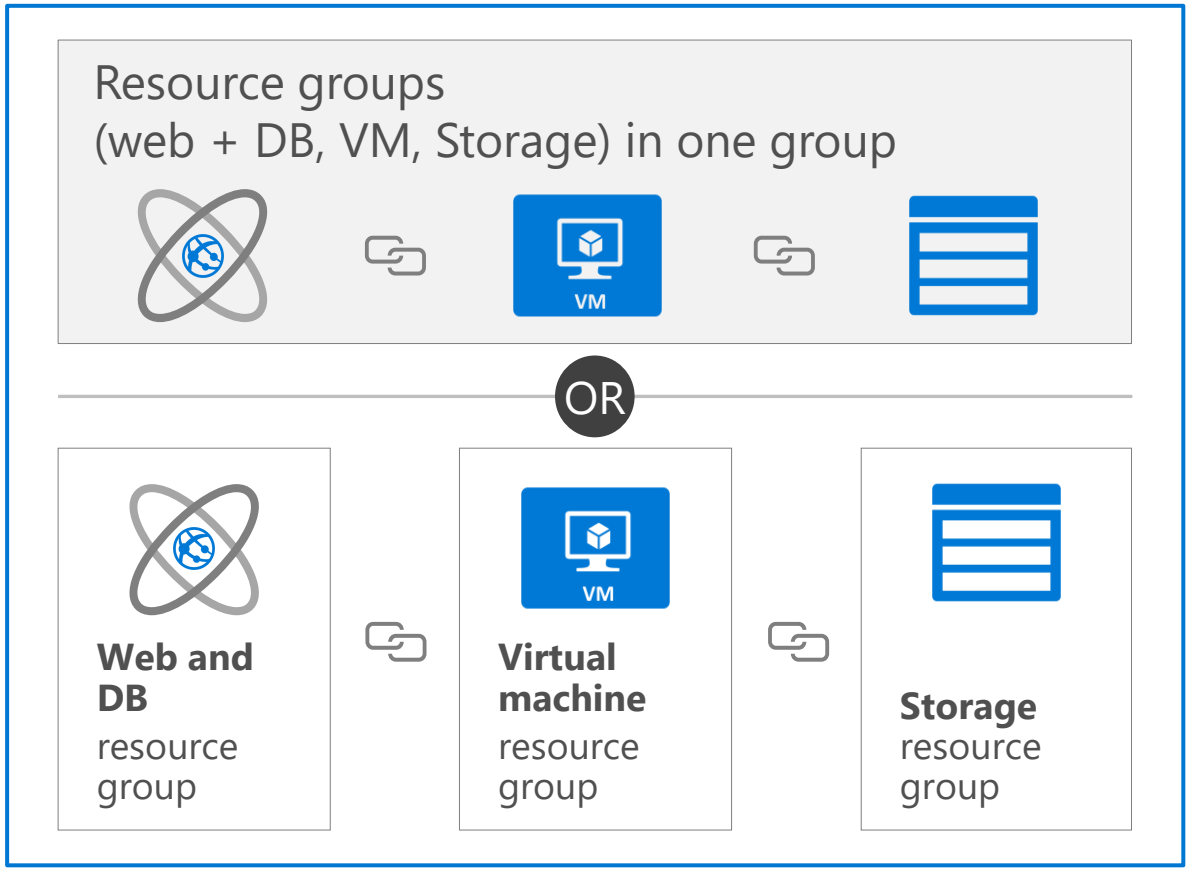
Azure **resources** are components like storage, virtual machines, and networks that are available to build cloud solutions.



Resource groups

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

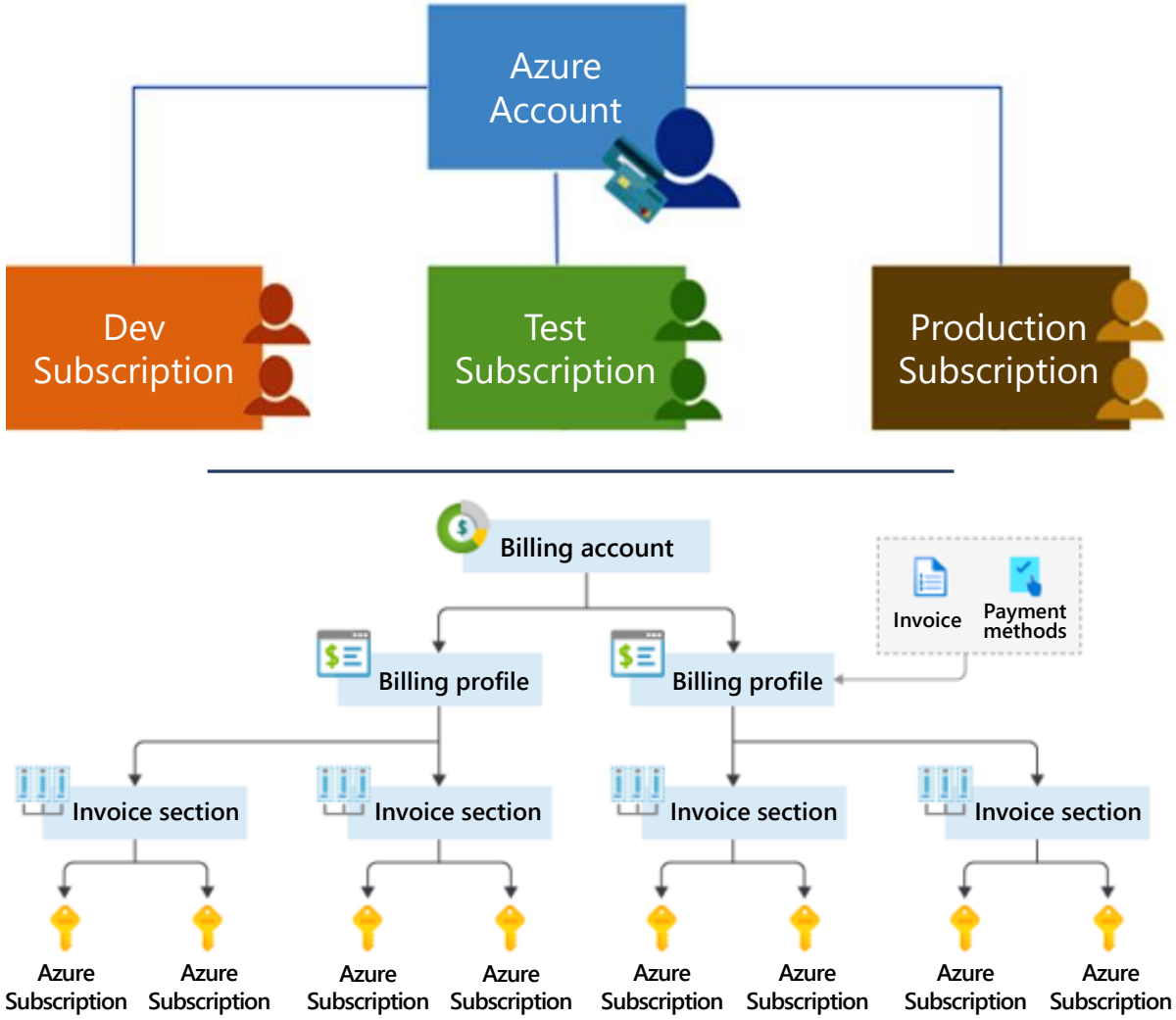
- Resources can exist in only one resource group.
- Resources can exist in different regions.
- Resources can be moved to different resource groups.
- Applications can utilize multiple resource groups.



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.



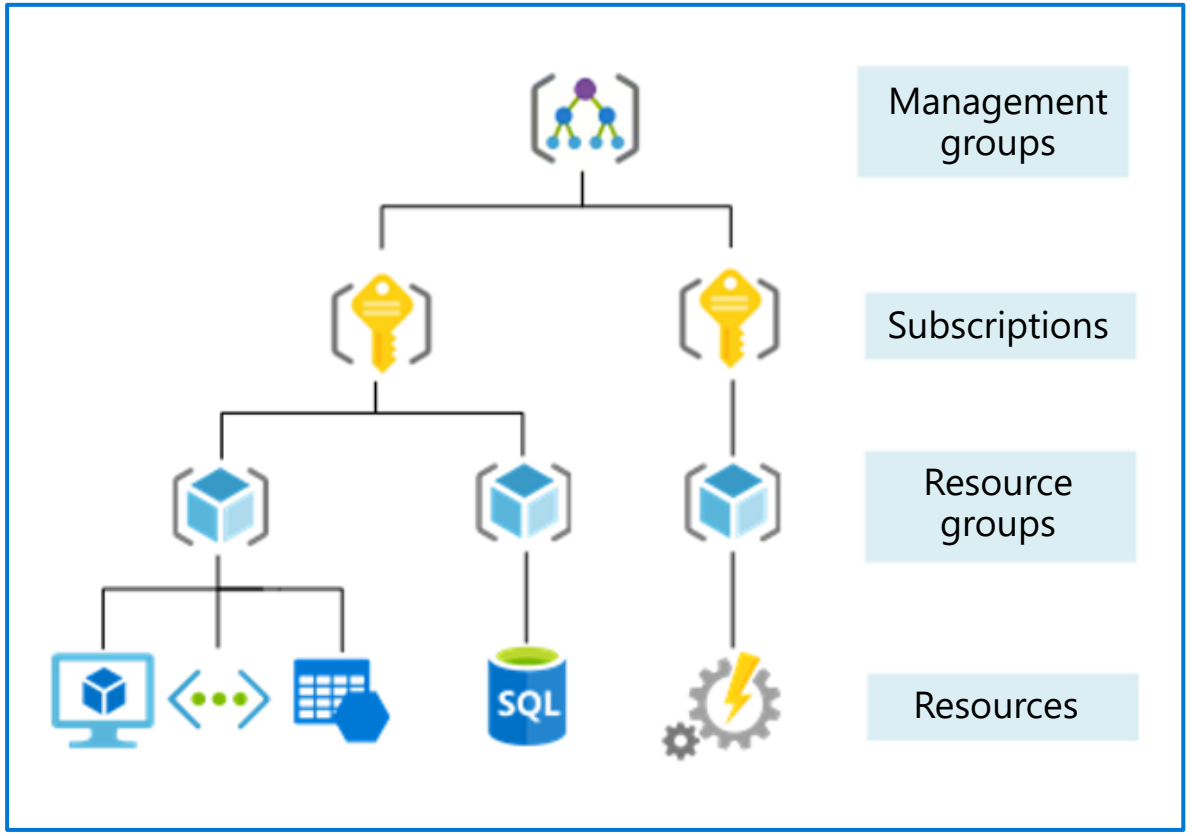
Management Groups

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



Demo

Create an Azure resource

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

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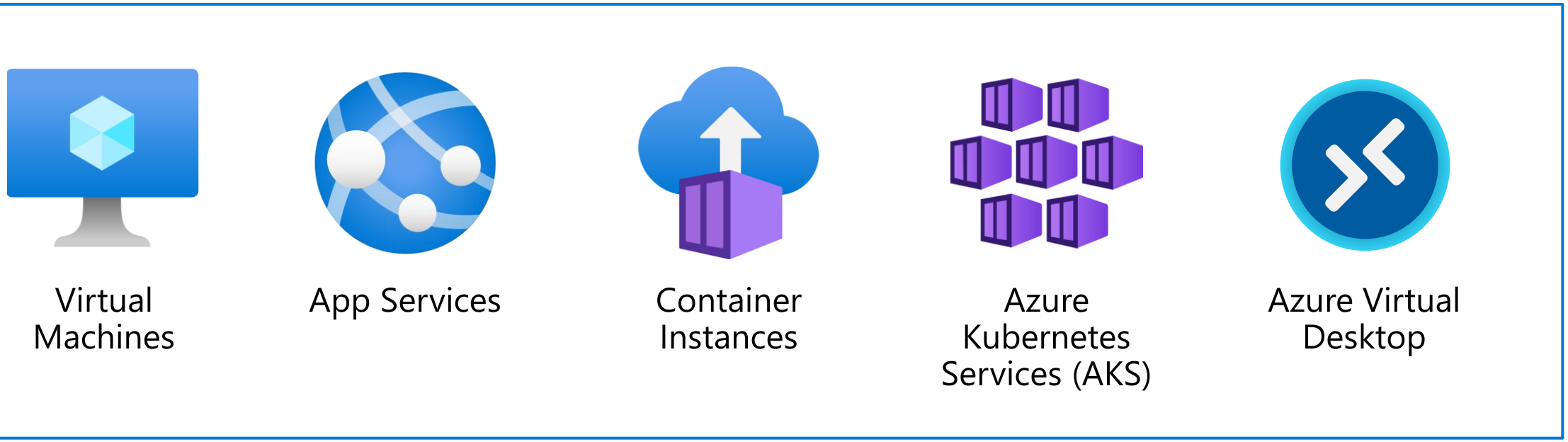
Learning Objective: Compute

Azure compute services

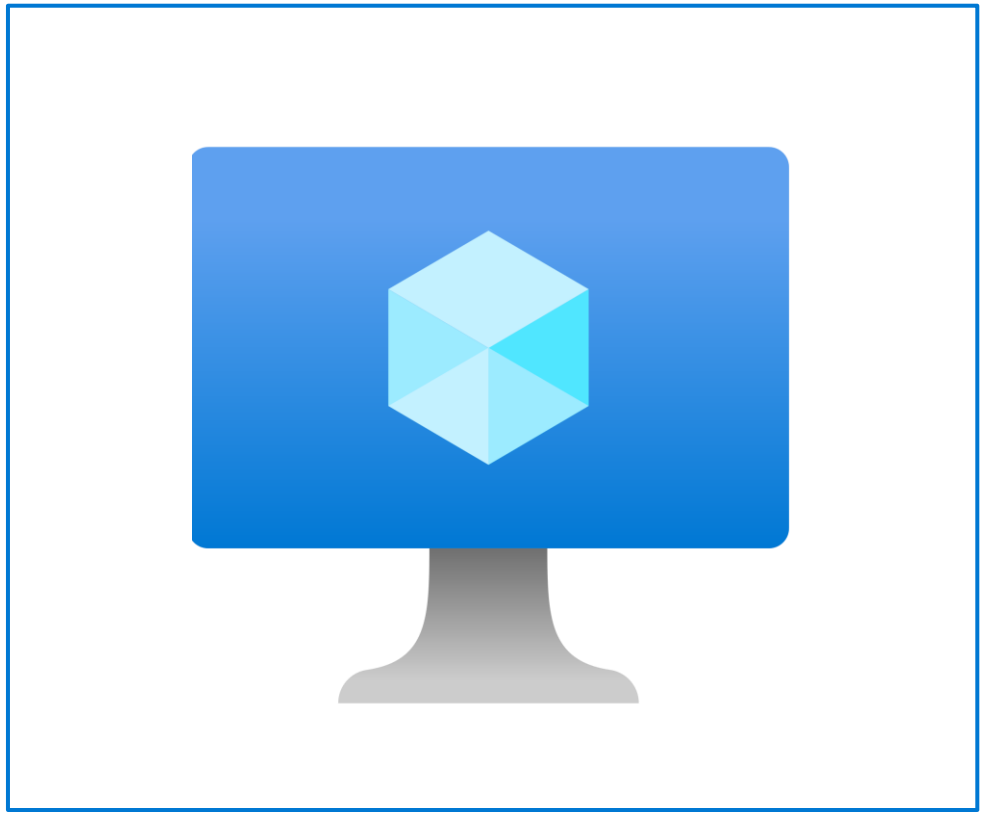
Azure **compute** is an on-demand computing service that provides computing resources such as disks, processors, memory, networking, and operating systems.



Azure virtual machines

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

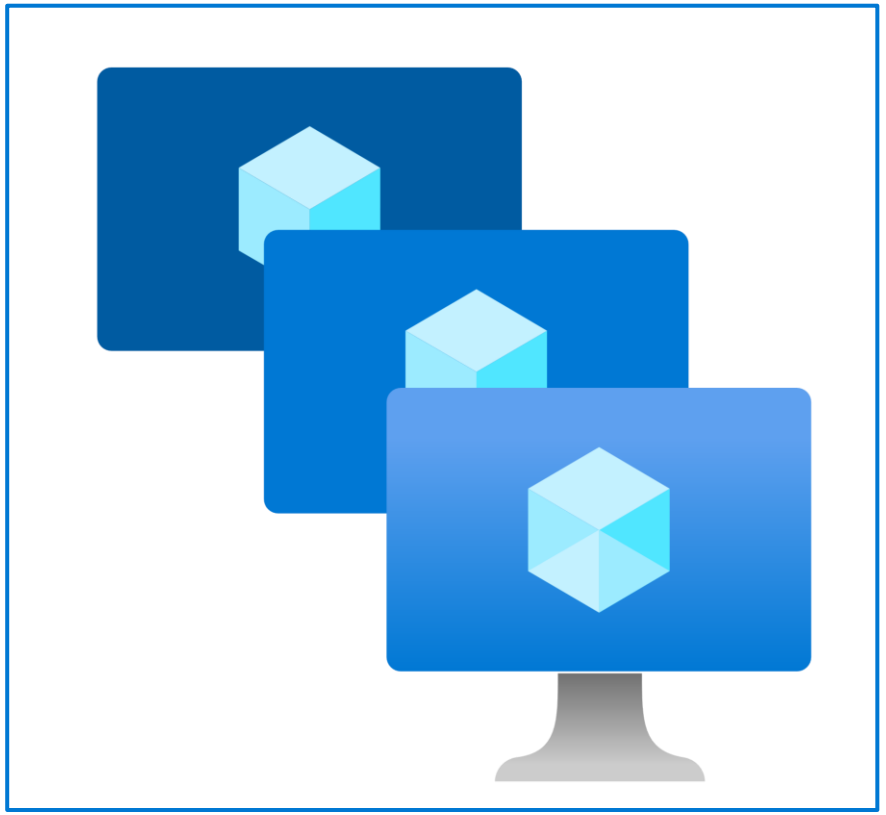
- Includes virtual processor, memory, storage, and networking.
- IaaS offering that provides total control and customization.



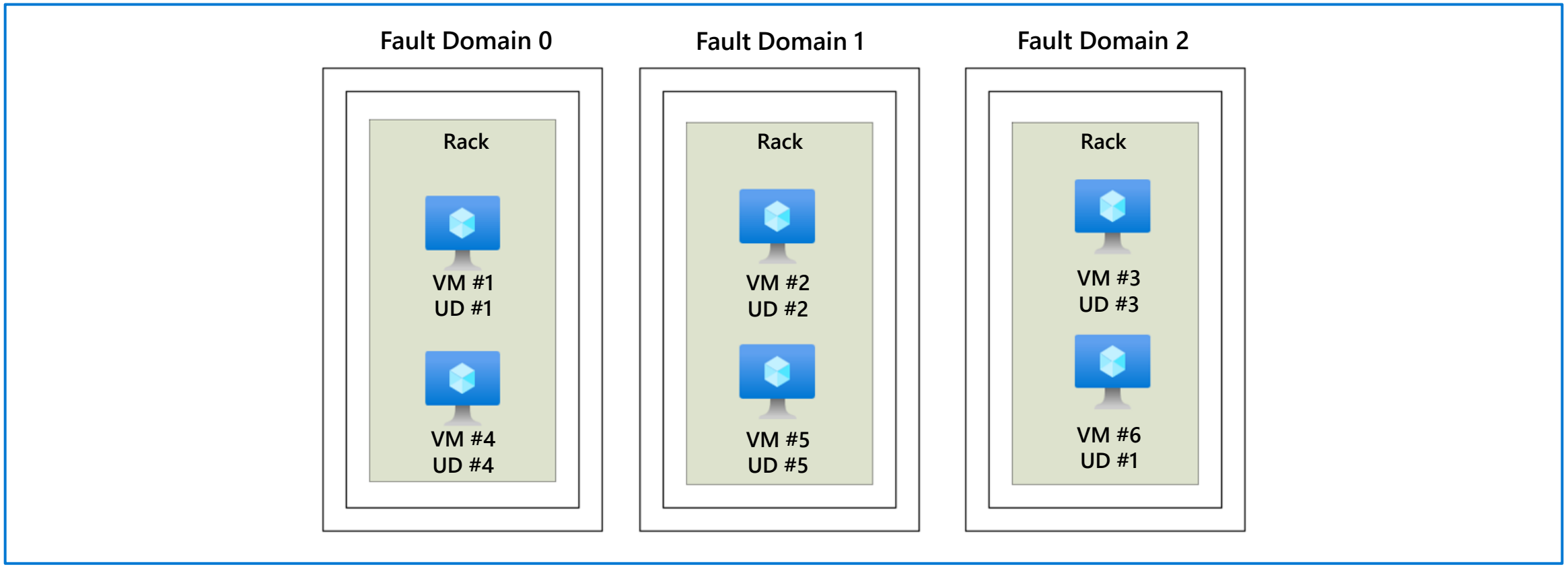
VM scale sets

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



Demo

Create and autoscale Virtual Machine Scale Sets

Azure Virtual Desktop

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

1. Create a full desktop virtualization environment without having to run additional gateway servers.
2. Reduce risk of resource being left behind.
3. 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 or pod of containers in Azure.

Azure Container Apps: a PaaS offering like container instances that can load balance and scale.

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

Comparing Azure compute options

Virtual machines	Virtual Desktop	Containers
Cloud based server that supports either Windows or Linux environments.	Provides a cloud based personal computer Windows desktop experience.	Lightweight, miniature environment well suited for running microservices.
Useful for lift-and-shift migrations to the cloud.	Dedicated applications to connect and use, or accessible from any modern browser.	Designed for scalability and resiliency through orchestration.
Complete operating system package, including the host operating system.	Multi-client login allows multiple users to log into the same machine at the same time.	Applications and services are packaged in a container that sits on-top of the host operating system. Multiple containers can sit on one host OS.

Azure Functions

Azure Functions: a PaaS offering that supports serverless compute operations. Event-based code runs when called without requiring server infrastructure during inactive periods.

Azure App Services

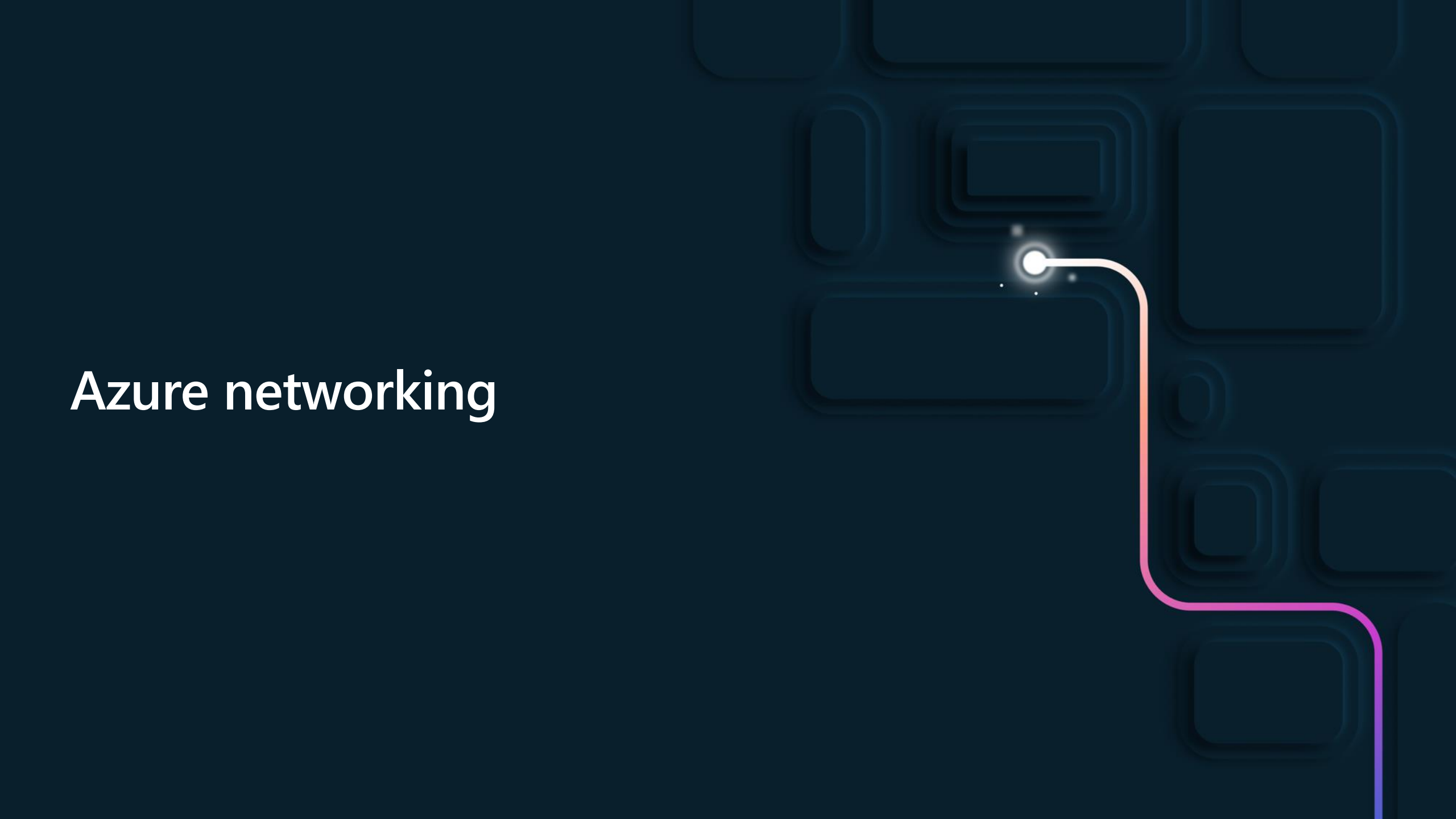
Azure **App Services** is a fully managed platform to build, deploy, and scale web apps and APIs quickly.

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

Session 02 Review

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

Azure networking



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Learning Objectives

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

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Learning Objective: 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

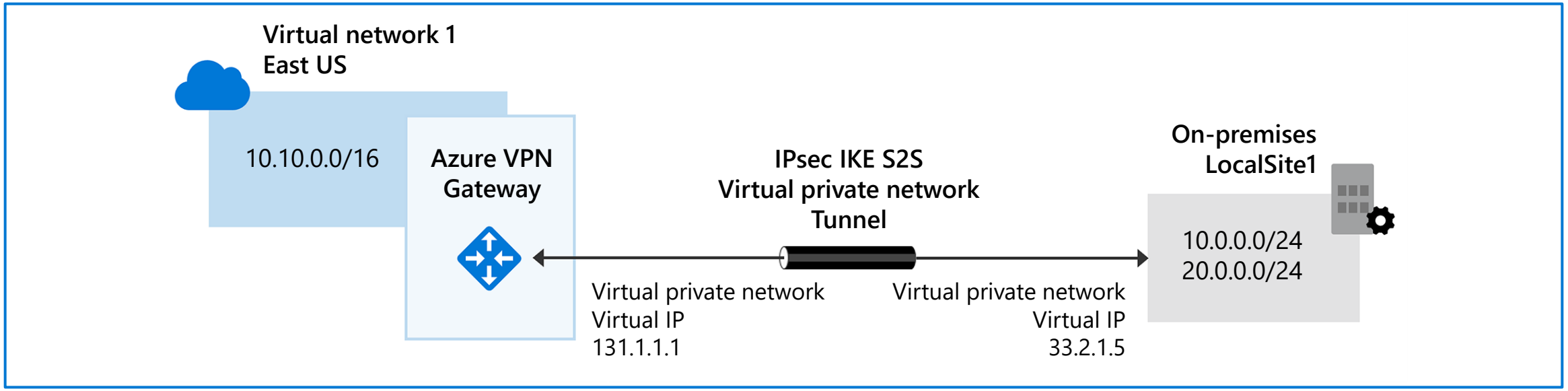
Demo

Configure network access

1. Verify currently open ports
2. Create a network security group
3. Configure RDP access
4. Test the connection

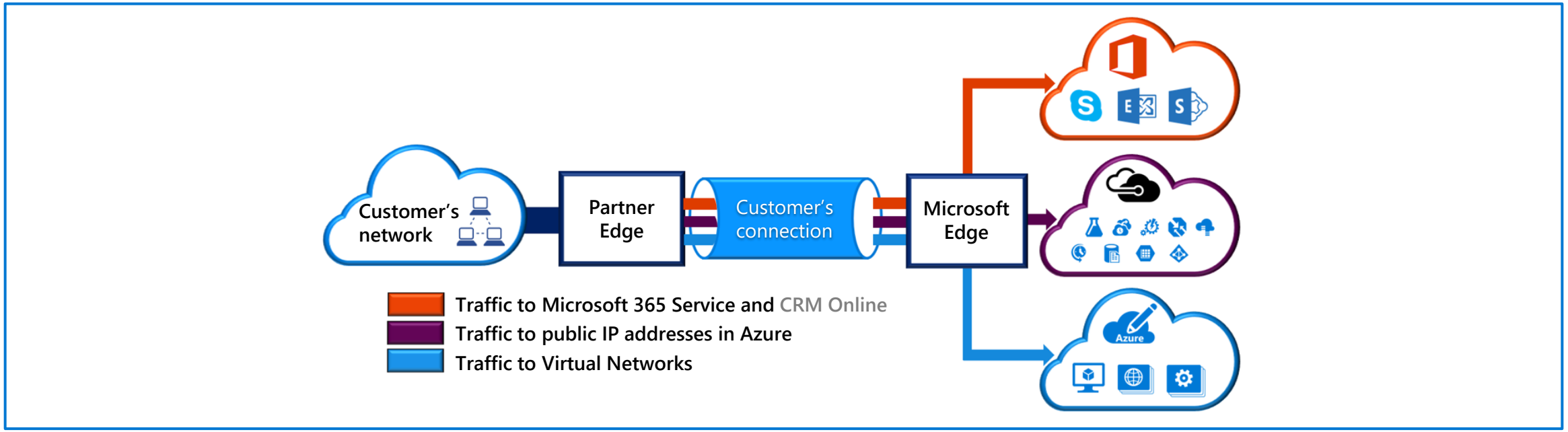
Azure Virtual Private Network Gateway

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

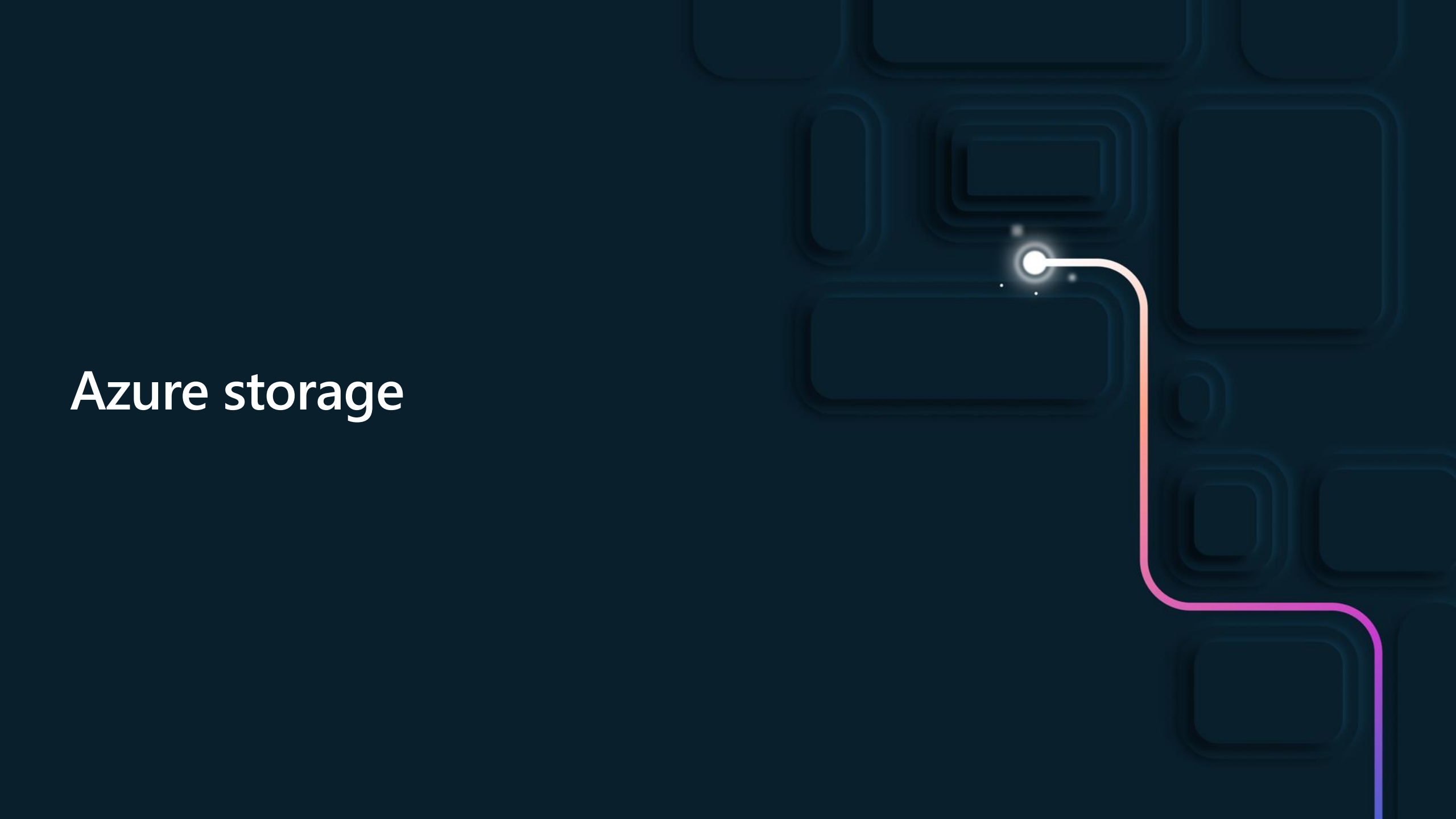
Customizable virtual networks allow you to use private, fully customized domain names in your private virtual networks

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

Session 03 Review

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

Azure storage



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Learning Objectives

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

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Learning Objective: Storage

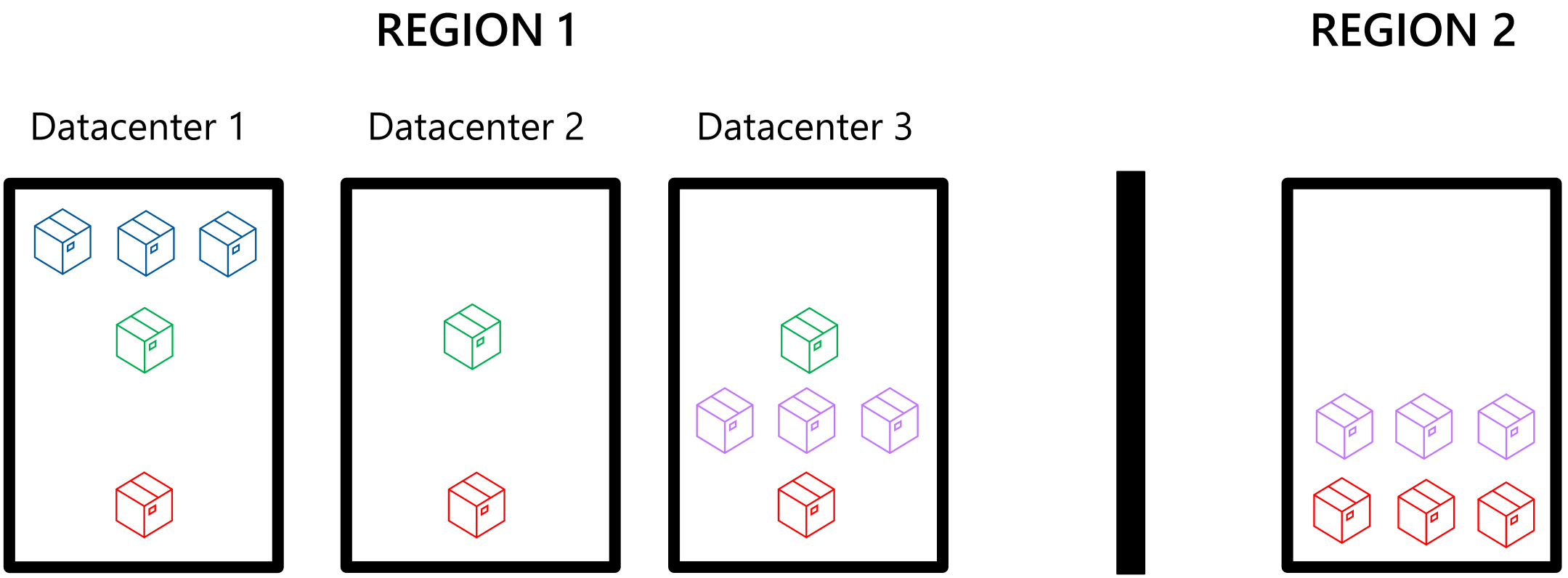
Storage accounts

- 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



Azure storage services

Azure Blob: optimized for storing massive amounts of unstructured data, such as text or binary data.

Azure Disk: provides disks for virtual machines, applications, and other services to access and use.

Azure Queue: message storage service that provides storage and retrieval for large amounts of messages, each up to 64KB.

Azure Files: sets up a highly available network file share that can be accessed by using the Server Message Block protocol.

Azure Tables: provides a key/attribute option for structured non-relational data storage with a schema-less design.

Storage service public endpoints

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

Azure storage access tiers

Hot	Cool	Cold	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 infrequently accessed and stored for at least 90 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.

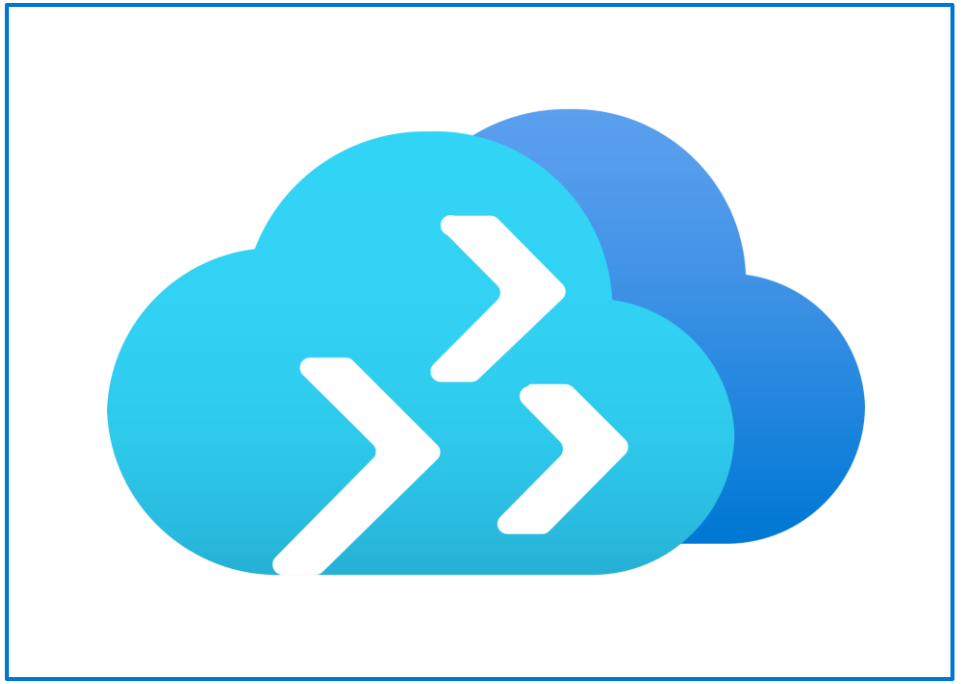
Demo

Create a storage blob

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

AzCopy	Azure Storage Explorer	Azure File Sync
Command line utility	Graphical user interface (similar to Windows Explorer)	Synchronizes Azure and on-premises Windows File Server in a bidirectional manner
Copy blobs or files to or from your storage account	Compatible with Windows, MacOS, and Linux	Cloud tiering keeps frequently accessed files local, while freeing up space
One-direction synchronization	Uses AzCopy to handle file operations	Rapid reprovisioning of failed local server (install and resync)

Session 04 Review

- Storage services
- Redundancy options
- File management and migration

Azure identity, access and security and Azure Essentials: Cost management

Microsoft

Learning Objectives

- **Identity, access, and security**
  - Directory services
  - Authentication methods
  - Security models
- **Azure Essentials: Cost Management**
  - Cost and pricing calculators
  - Cost Management and tags

Microsoft

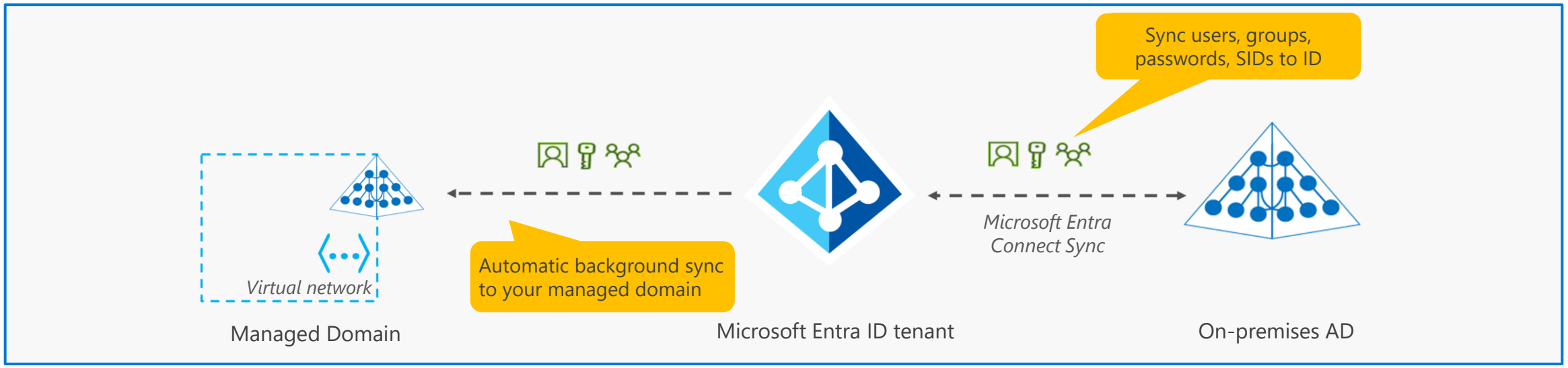
Learning Objective: Identity, access, and security

Microsoft Entra ID

Microsoft Entra ID 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).
- Device management.

Microsoft Entra Domain Services



- 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 Microsoft Entra ID

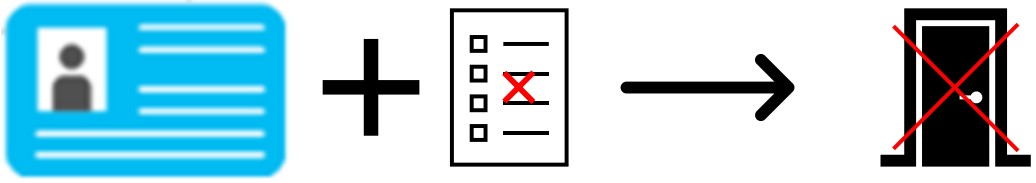
Compare Authentication and Authorization

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.

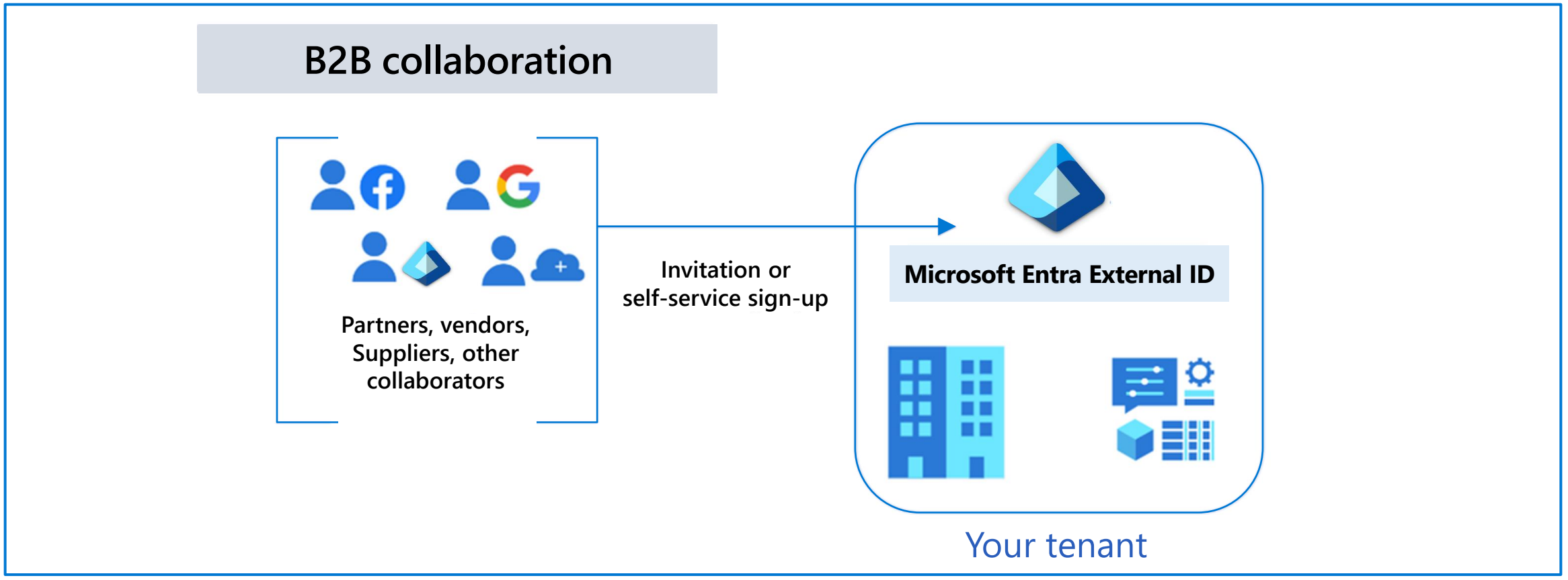


Azure Multi-Factor Authentication

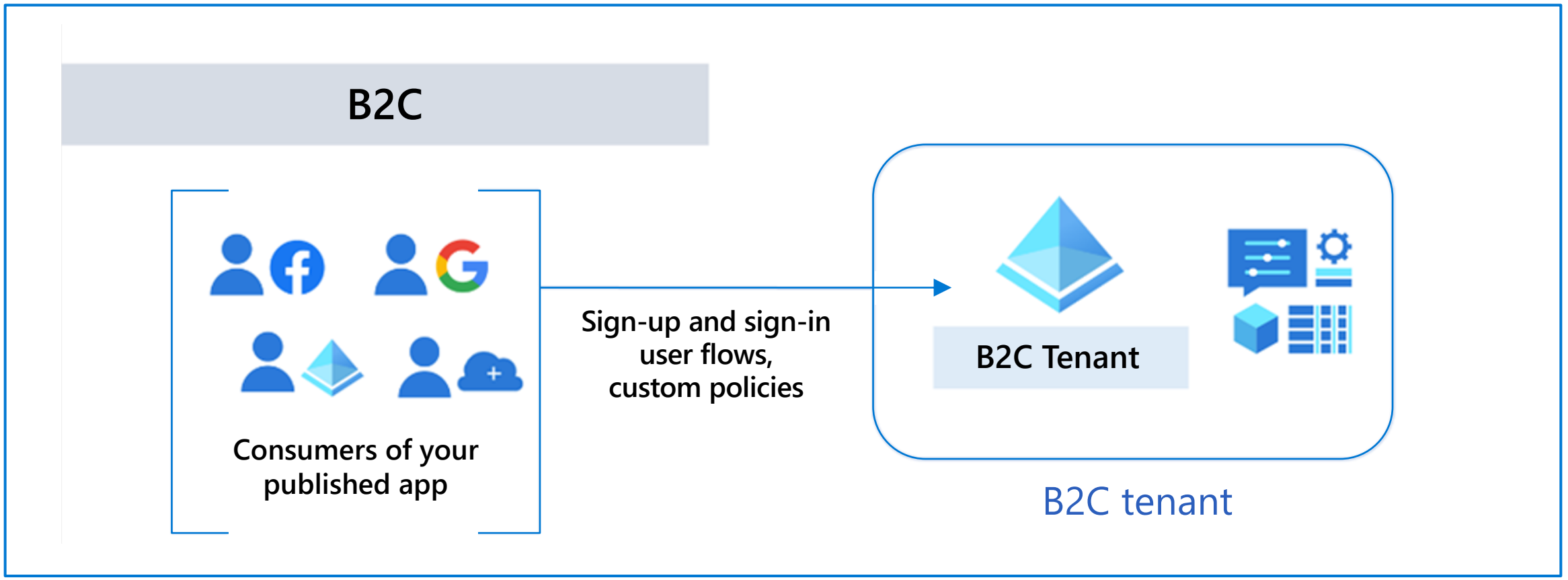
Provides additional security for your identities by requiring two or more elements for full authentication.

- Something you know ←→ Something you possess ←→ Something you are

Microsoft Entra External ID B2B



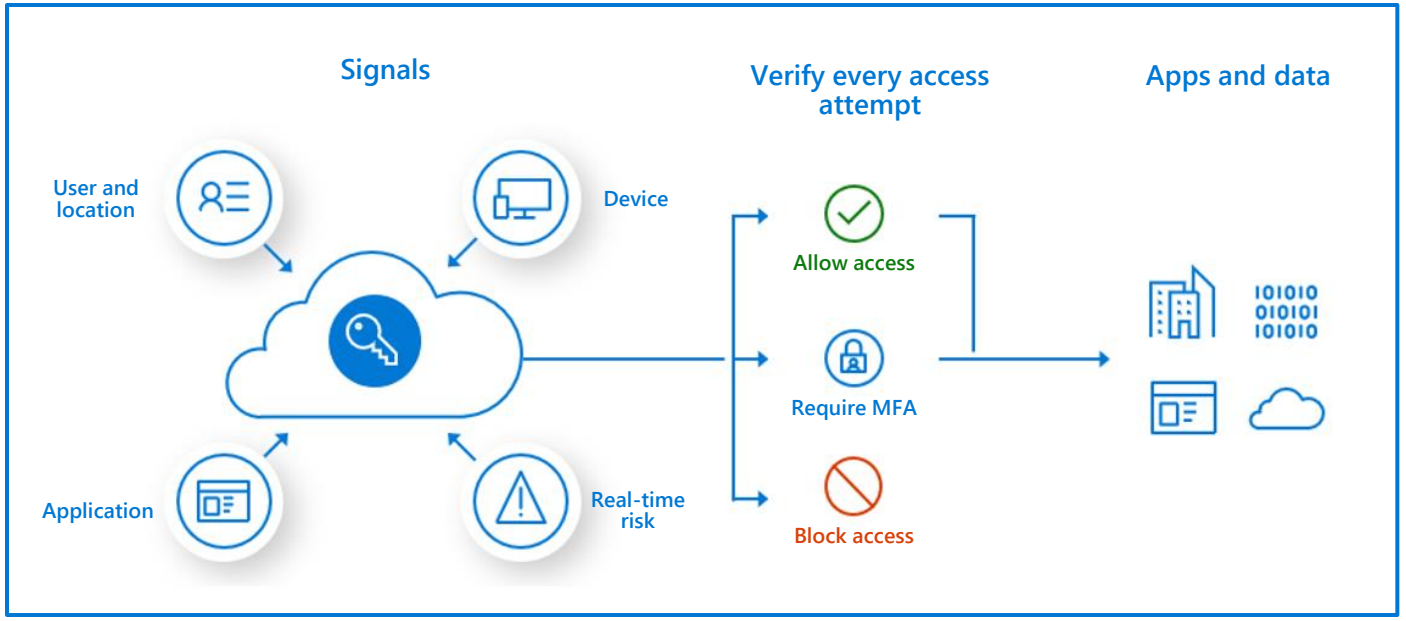
External Identities B2C



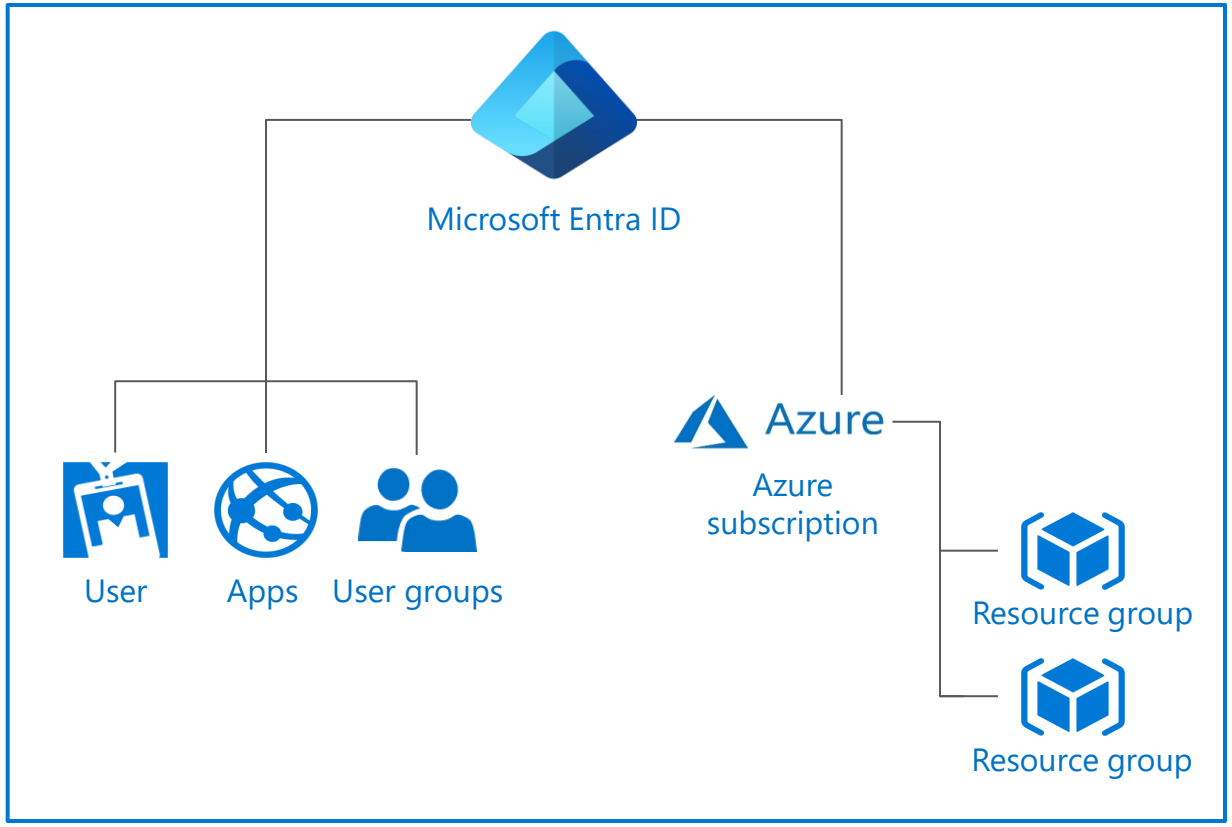
Conditional Access

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

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



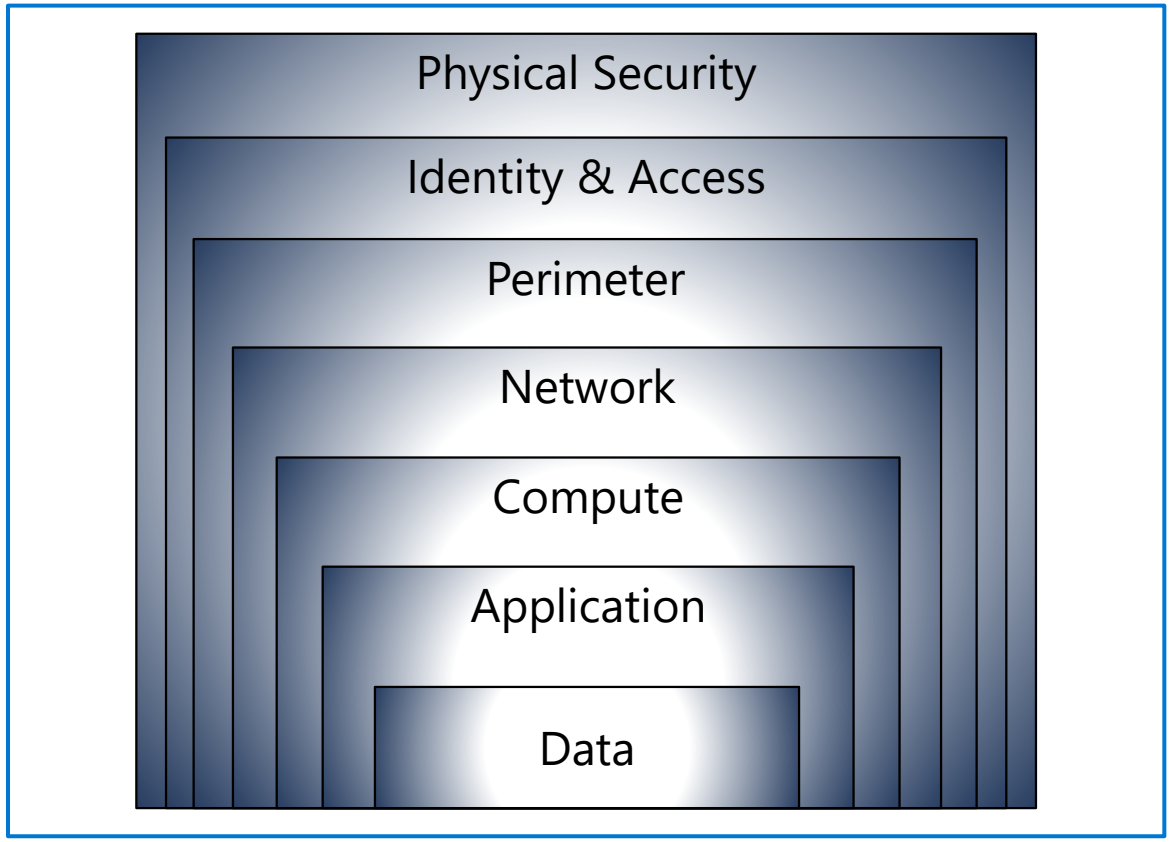
Role-based access control



- 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

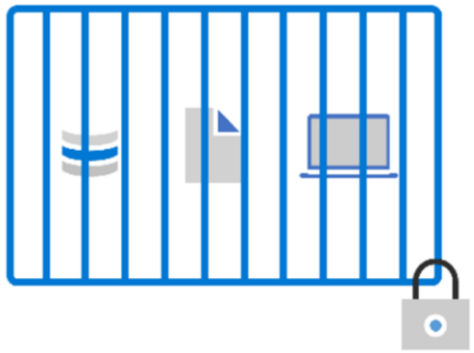
- A layered approach to securing computer systems
- Provides multiple levels of protection
- Attacks against one layer are isolated from subsequent layers



Zero Trust

Secure assets where they are with Zero Trust

Simplify security and make it more effective



Classic Approach

Restrict everything to a 'secure' network

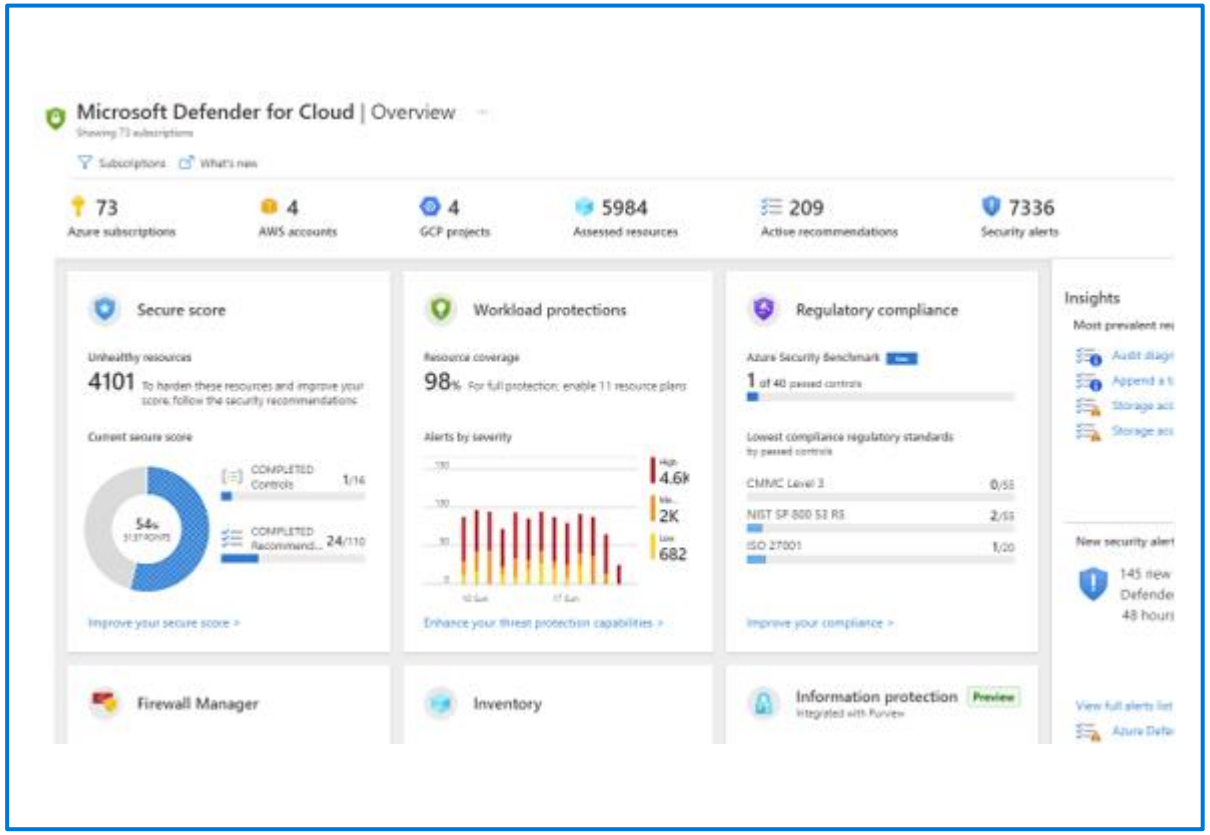
Zero Trust

Protect assets anywhere with central policy

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



Microsoft

Learning Objective:
Azure Essentials – 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

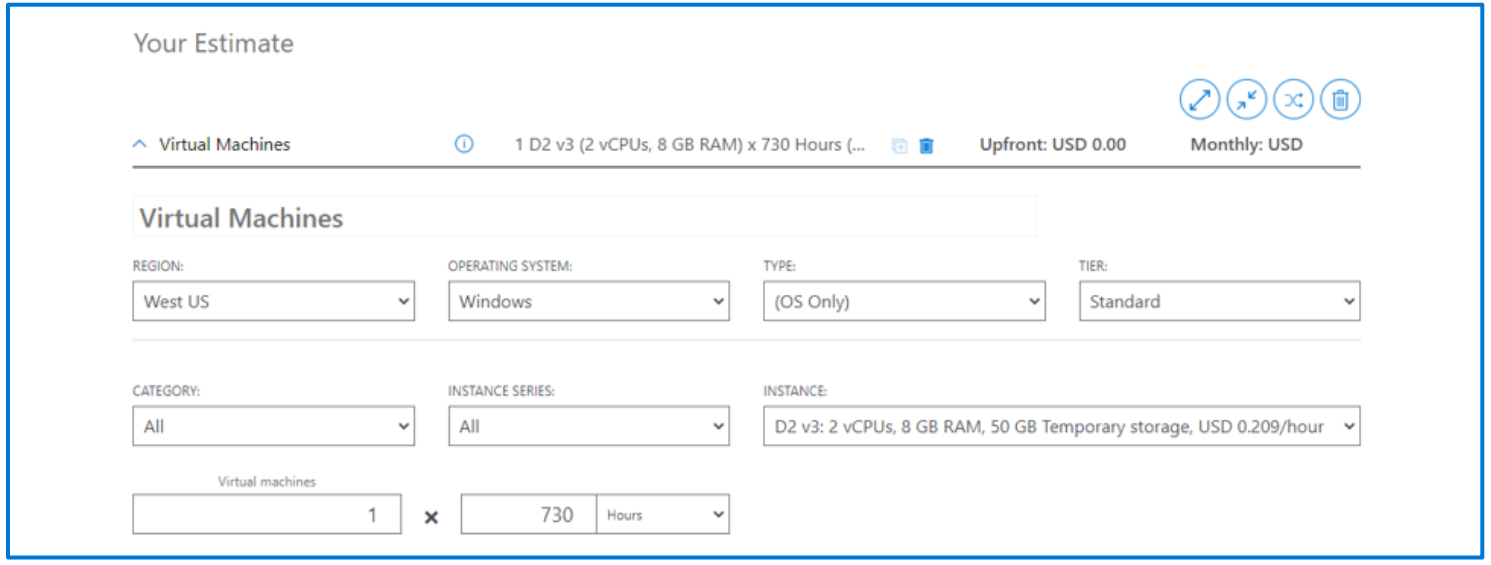
Azure Marketplace allows customers to find, try, purchase, and provision applications and services from hundreds of leading service providers, which are all certified to run on Azure.

- 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



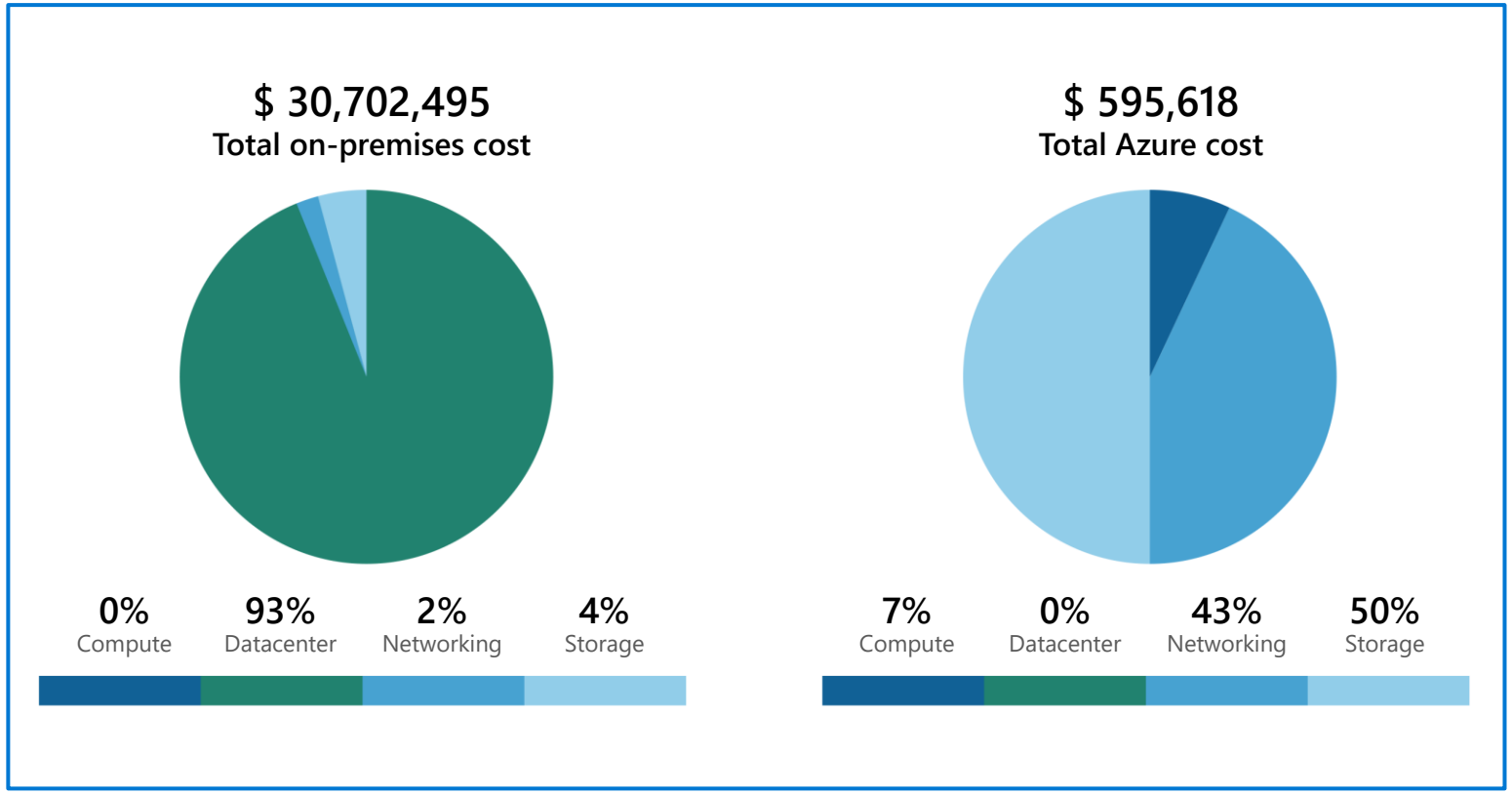
Demo

Use the Azure Pricing Calculator

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.

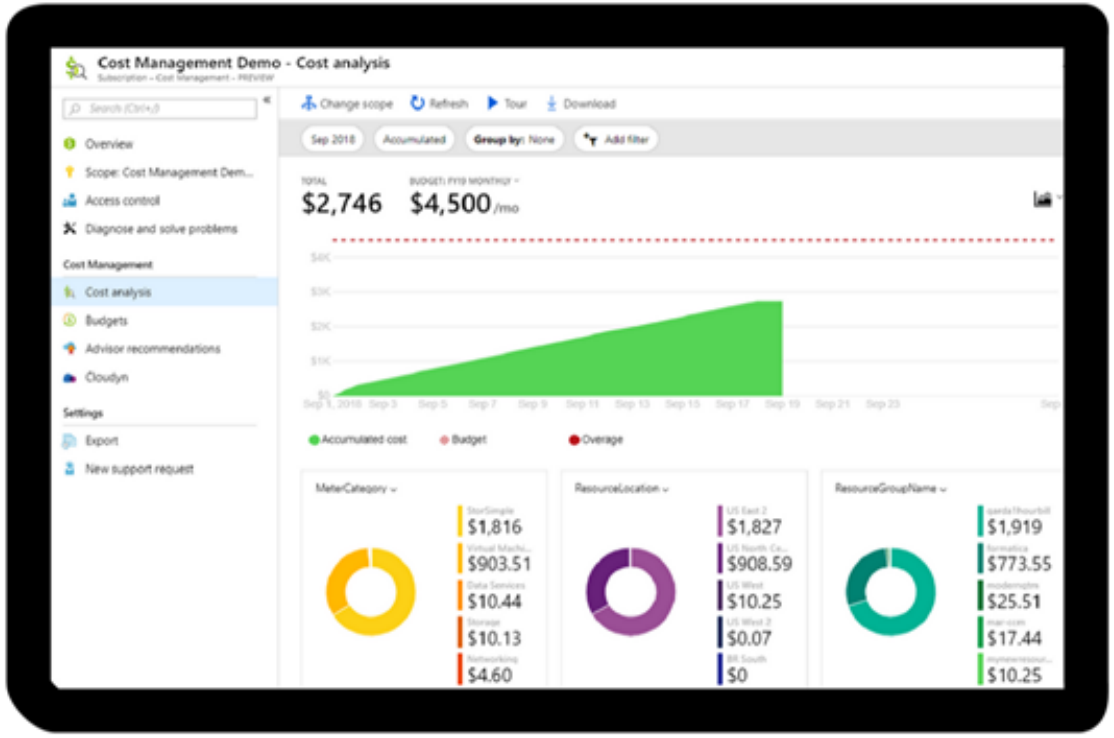


Demo

Use the Azure TCO Calculator

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

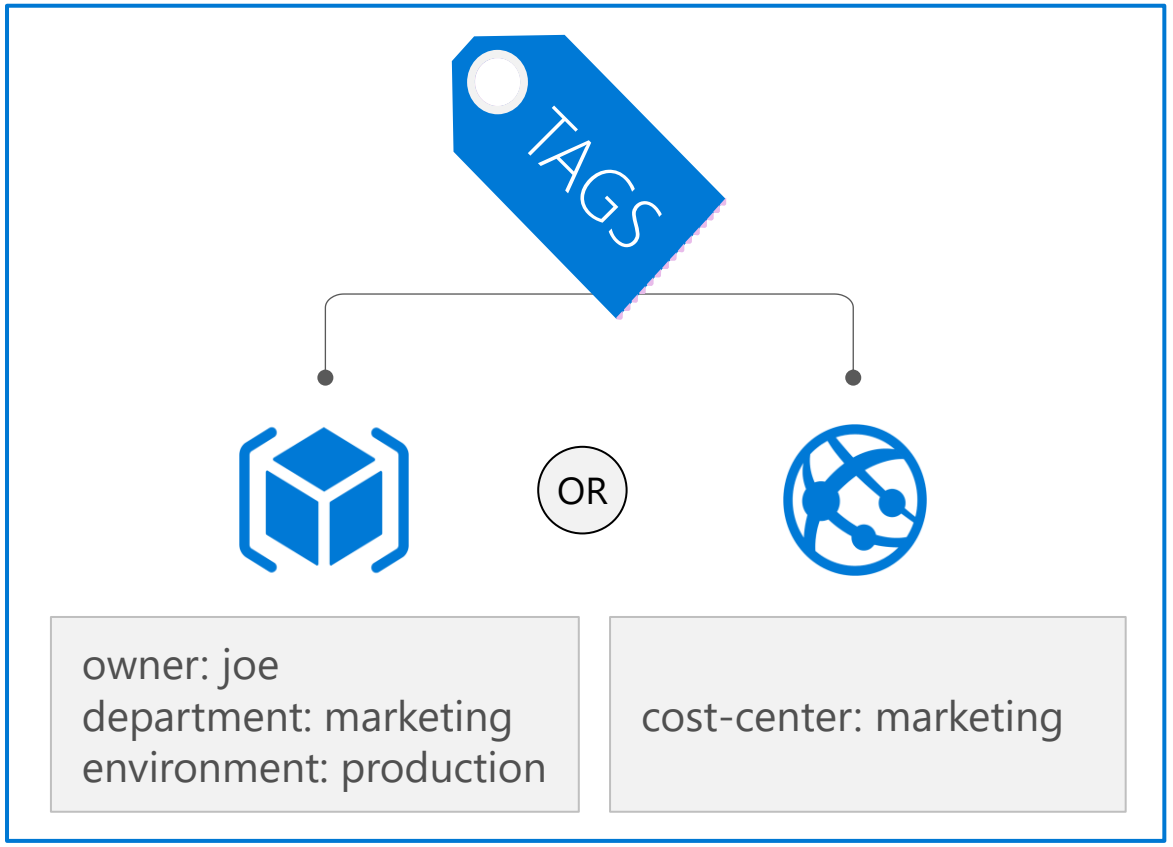
Azure Essentials: Microsoft Cost Management



- 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.



Session 05 Review

- Directory services
- Authentication methods
- Security models
- Azure Essentials: Cost Management
  - Cost and pricing calculators
  - Cost management and tags
  - Cost management

Azure governance and compliance, Azure resource management, and Azure monitoring services

Microsoft

Learning Objectives

- **Governance and compliance**
  - Microsoft Purview
  - Policies and resource locks
  - Service Trust portal
- **Resource deployment tools**
  - Portal, PowerShell, CLI, and others
  - Azure Arc and Azure Resource Manager
- **Monitoring tools**
  - Azure Advisor, Azure Service Health, and Azure Monitor

Microsoft

Learning Objective: Governance and compliance

Microsoft Purview

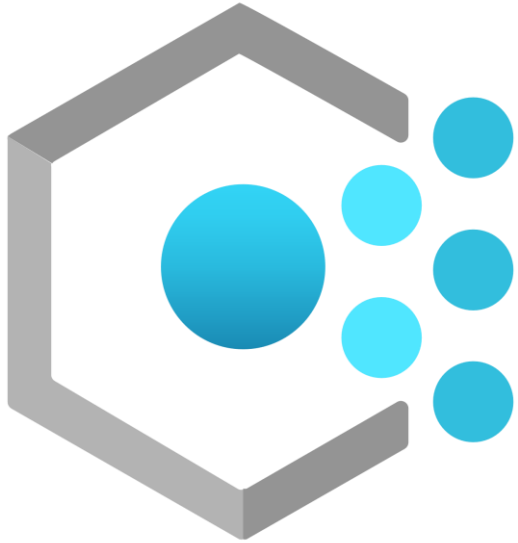
Microsoft Purview is a family of data governance, risk, and compliance solutions that helps you get a single, unified view into your data. Microsoft Purview brings insights about your on-premises, multi-cloud, and software-as-a-service data together.

- Automated data discovery
- Sensitive data classification
- End-to-end data lineage

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.

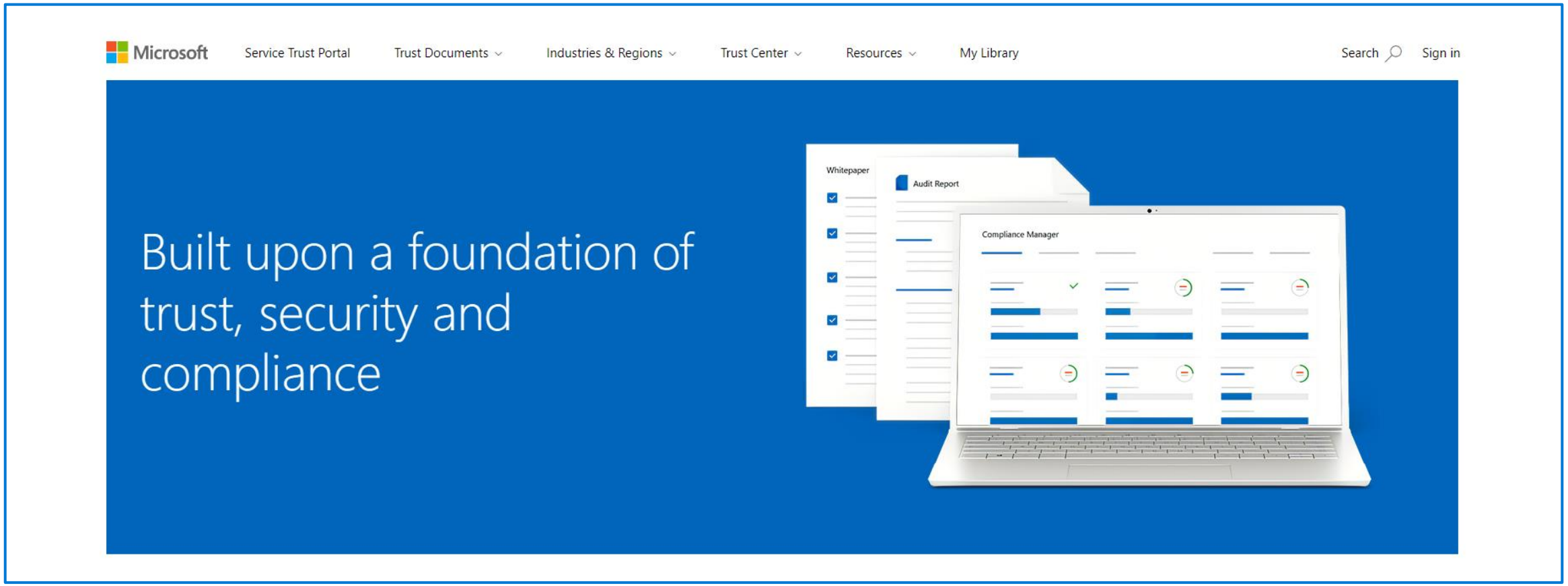
Lock Types	Read	Update	Delete
Delete	Yes	Yes	No
ReadOnly	Yes	No	No

Demo

Manage Resource Locks

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

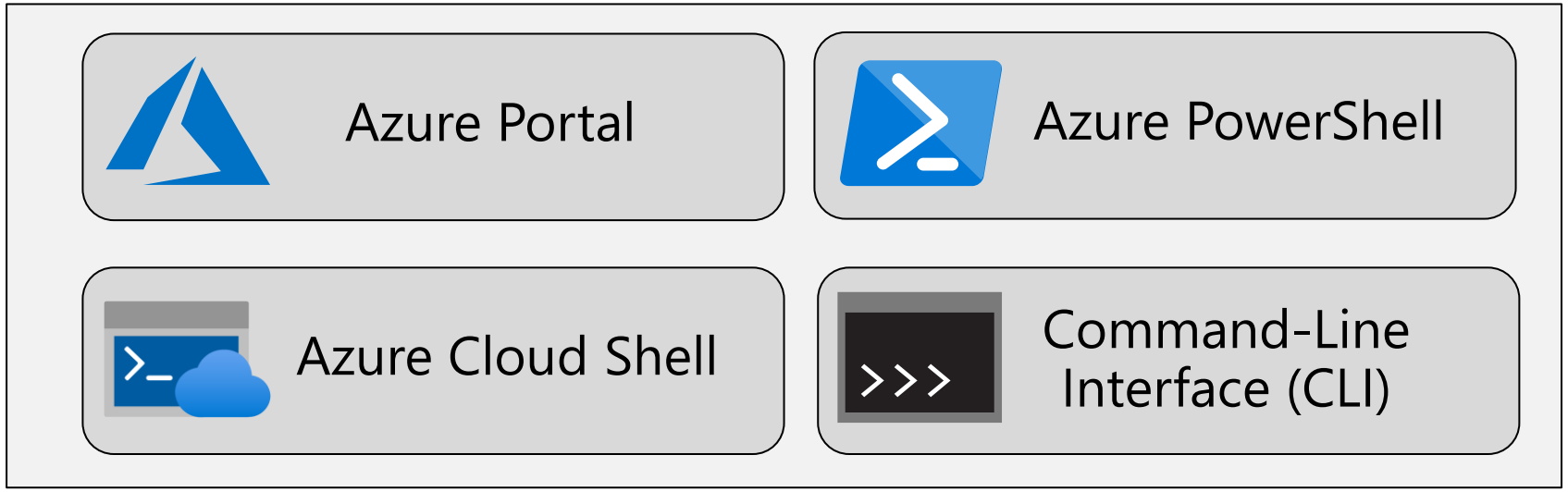
Service Trust portal



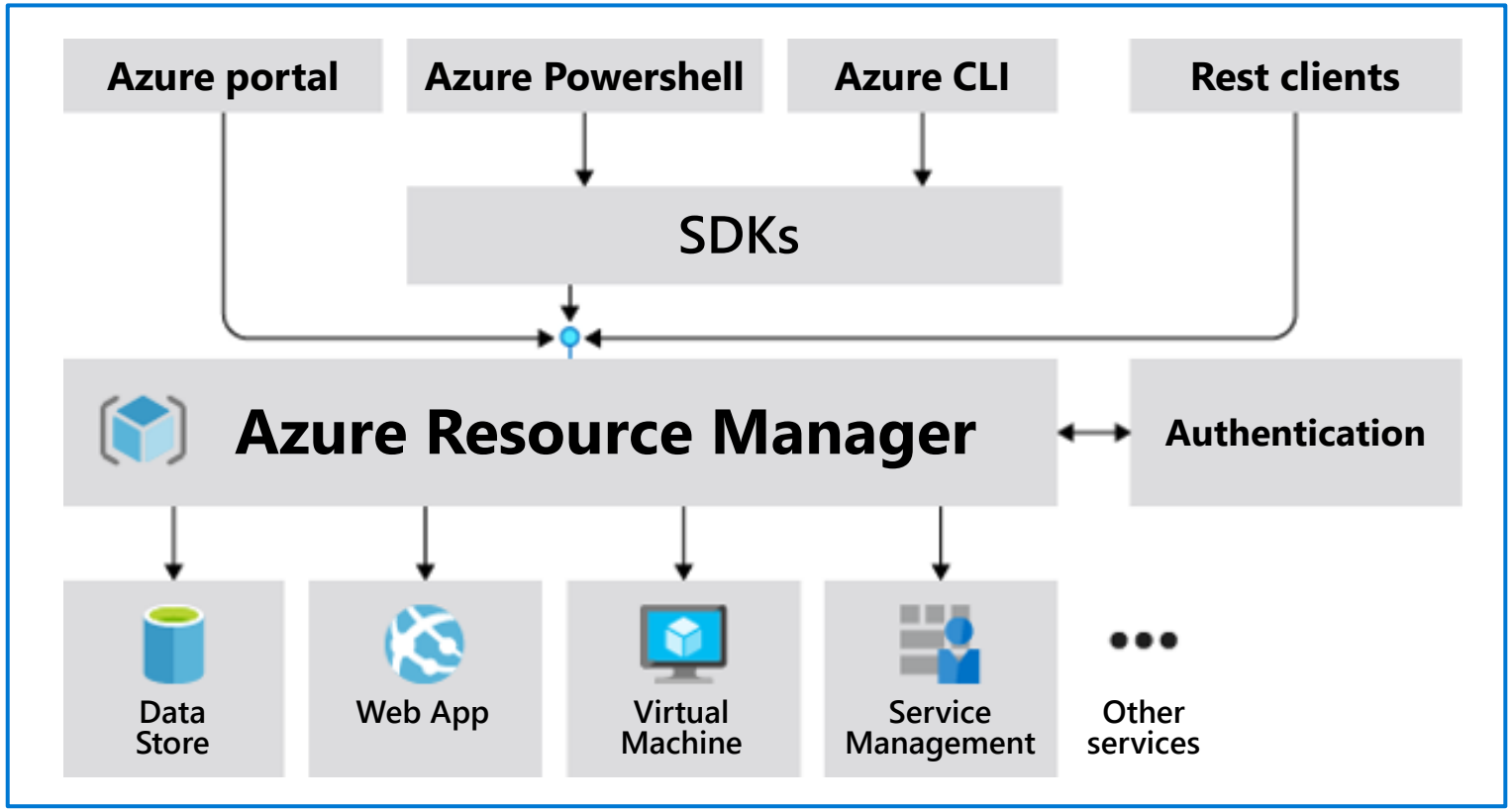
Microsoft

Learning Objective: Resource deployment tools

Tools for interacting with Azure



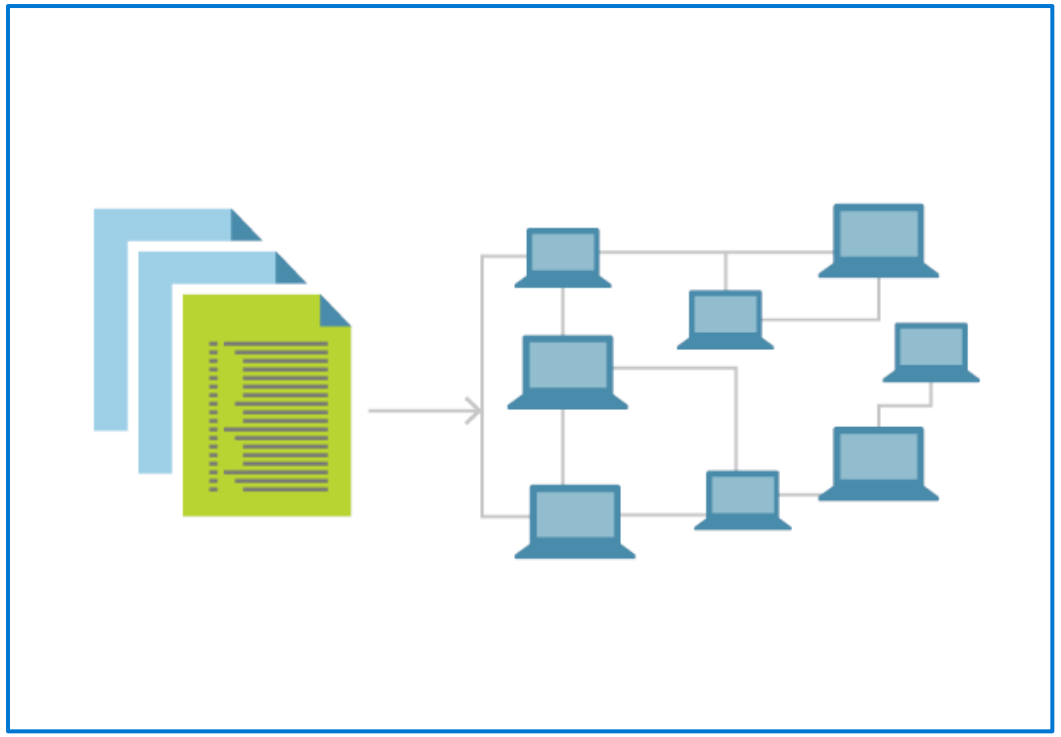
Azure Resource Manager



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

Infrastructure as code

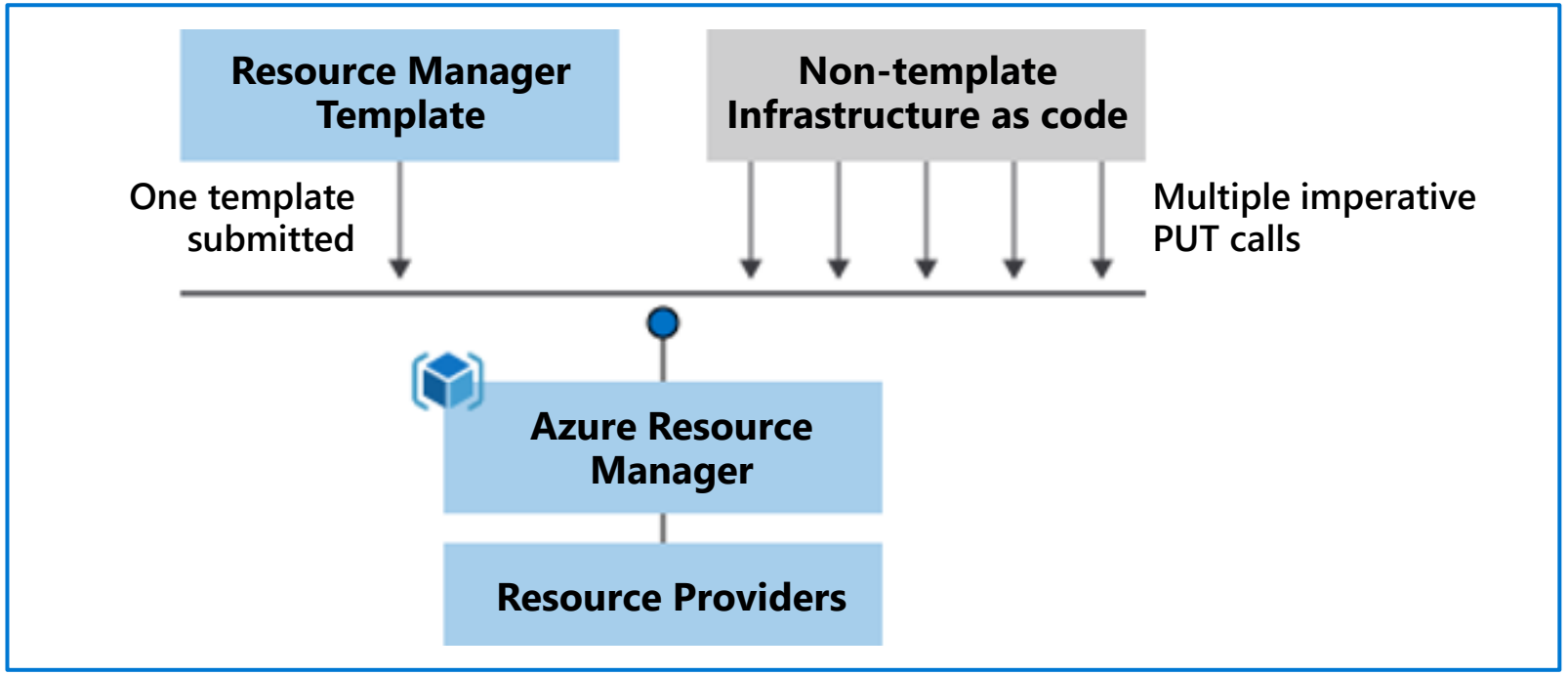
- Ensure consistency in deployment across your cloud ecosystem.
- Manage configuration at scale.
- Rapidly provision additional environments based on a standard configuration and build.



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



Bicep

Bicep

```
param location string = resourceGroup().location
param storageAccountName string = 'toylaunch${uniqueString(resourceGroup().id)}'

resource storageAccount 'Microsoft.Storage/storageAccounts@2021-06-01' = {
  name: storageAccountName
  location: location
  sku: {
    name: 'Standard_LRS'
  }
  kind: 'StorageV2'
  properties: {
    accessTier: 'Hot'
  }
}
```

JSON

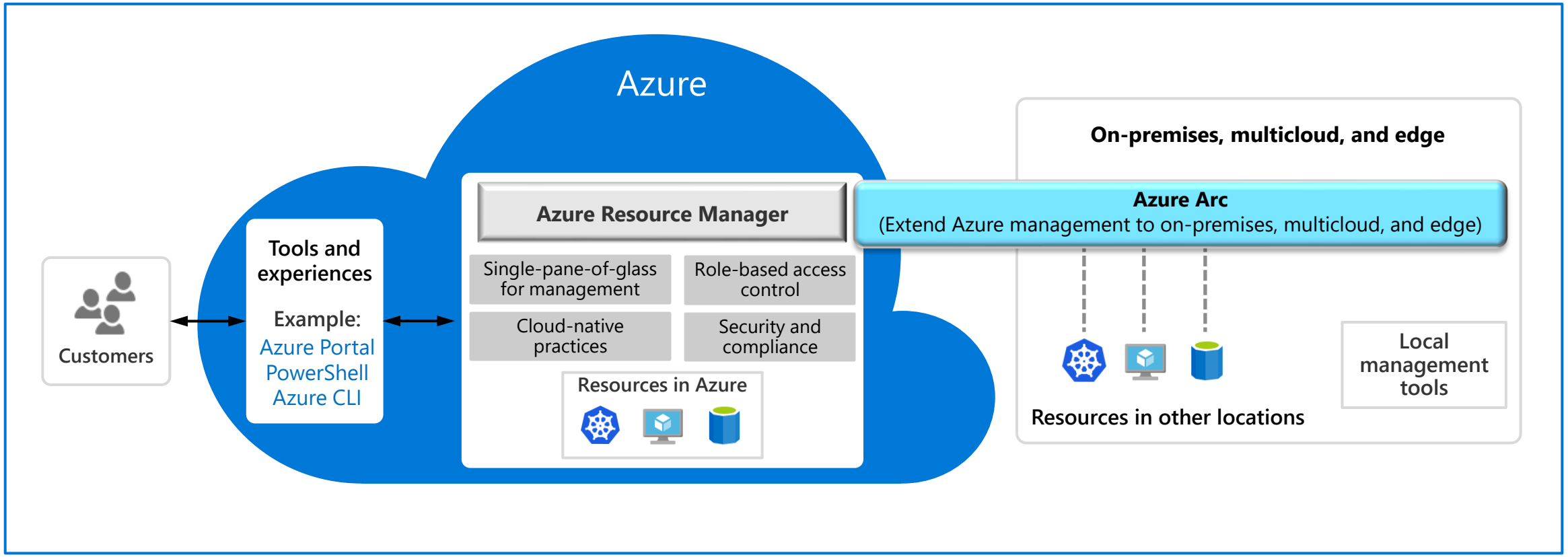
JSON

```
{
  "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
  "contentVersion": "1.0.0.0",
  "parameters": {
    "location": {
      "type": "string",
      "defaultValue": "[resourceGroup().location]"
    },
    "storageAccountName": {
      "type": "string",
      "defaultValue": "[format('toylaunch{0}', uniqueString(resourceGroup().id))]"
    }
  },
  "resources": [
```

JSON

```
  "resources": [
    {
      "type": "Microsoft.Storage/storageAccounts",
      "apiVersion": "2021-06-01",
      "name": "[parameters('storageAccountName')]",
      "location": "[parameters('location')]",
      "sku": {
        "name": "Standard_LRS"
      },
      "kind": "StorageV2",
      "properties": {
        "accessTier": "Hot"
      }
    }
  ]
}
```

Azure Arc


Azure
Azure Resource Manager
Single-pane-of-glass for management
Role-based access control
Cloud-native practices
Security and compliance
Resources in Azure
Tools and experiences
Example:
Azure Portal
PowerShell
Azure CLI
Customers
On-premises, multicloud, and edge
Azure Arc
(Extend Azure management to on-premises, multicloud, and edge)
Resources in other locations
Local management tools

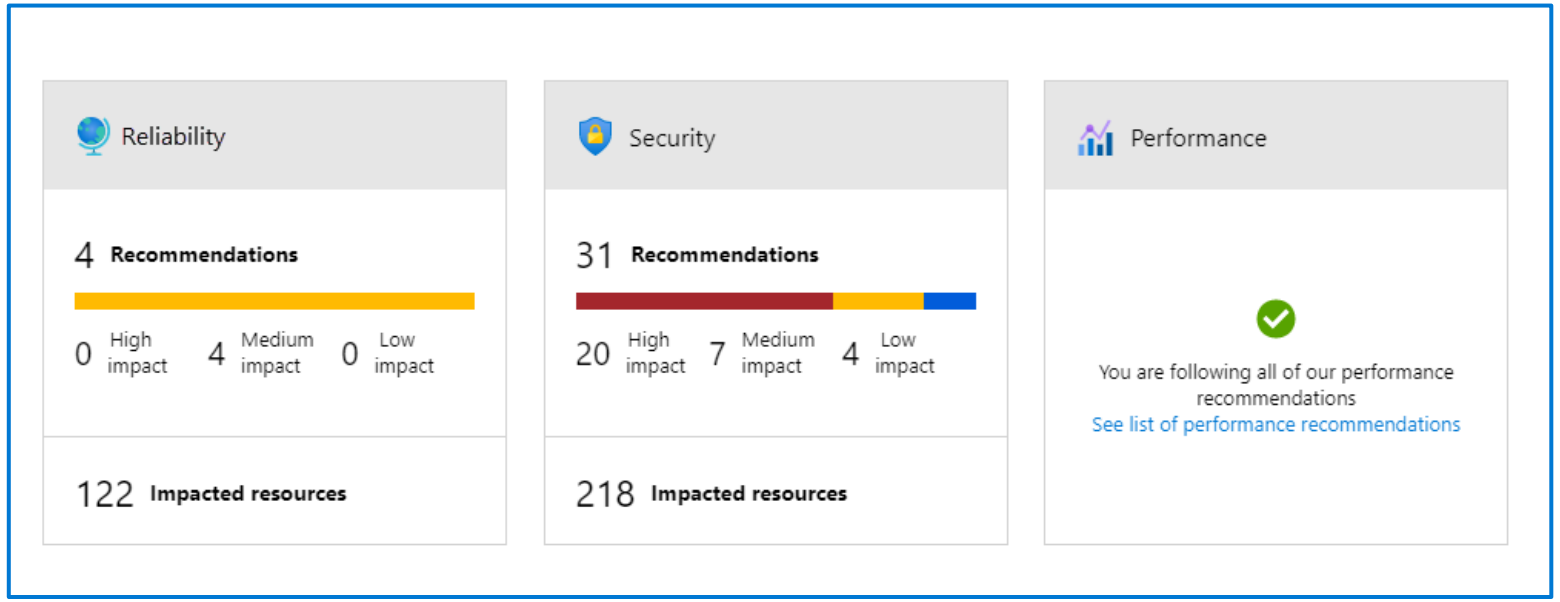
Microsoft

Learning Objective: Monitoring tools

Azure Essentials: 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

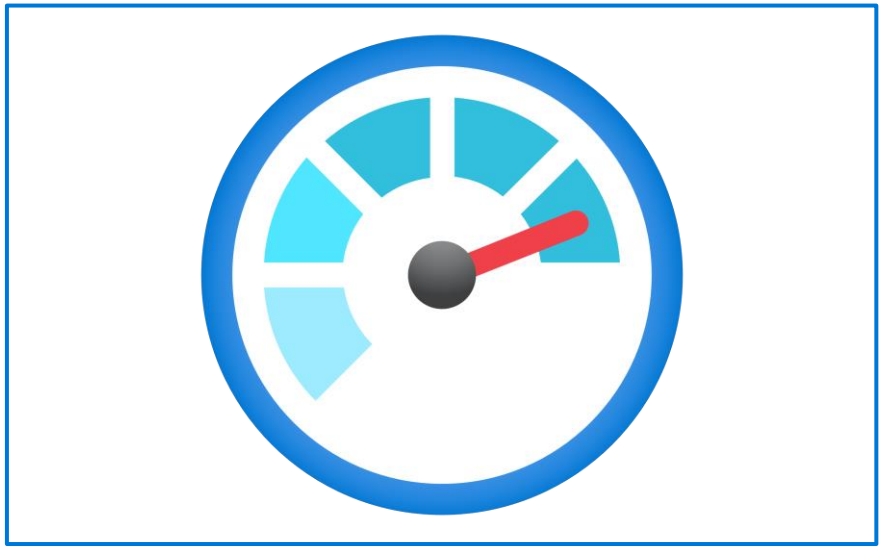
Service Health: focused view on only the services and regions that you're using. If a service is experiencing a problem in a region you're not using, it won't show up here

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 on-premises environments.

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



Session 06 Review

- Governance and compliance
- Resource deployment tools
- Monitoring tools