AZURE FUNDAMENTALS [AZ-900]

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Course Agenda

M01: Cloud concepts

- L01 - Learning objectives
- L02 - Why cloud services?
- L03 - Types of cloud models
- L04 - Types of cloud services
- L05 - Module 1 review questions

M02: Core Azure services

- L01 - Learning objectives
- L02 - Core Azure architectural components
- L03 - Core Azure services and products
- L04 - Azure solutions
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Course Agenda (continued #1)

- M03: Security, privacy, compliance, and trust
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  - L03 - Core Azure identity services
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  - L06 - Monitoring and reporting in Azure
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  - L08 - Module 3 review questions

Course Agenda (continued #2)

- M04: Azure pricing and support
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  - L02 – Azure subscriptions
  - L03 – Planning and managing costs
  - L04 - Support options available with Azure
  - L05 - Azure service level agreements (SLAs)
  - L06 - Service lifecycle in Azure
  - L08 - Module 4 review questions

Course description

Azure Fundamentals introduces cloud services, and how these services are provided by Microsoft Azure. Take this course as a first step towards learning about cloud computing and Azure, before taking further courses.

This course covers:

- General cloud computing **concepts, models, and services** such as:
    - *Public*, *Private*, and *Hybrid* clouds
    - *Infrastructure*, *Platform*, and *Software as a Service*
- Core **Azure products**, **services and tools** for security, privacy, compliance, and trust
- Azure **pricing and support** options

Certification areas (AZ-900)

Study areas	Weights
Understanding cloud concepts	15-20%
Understanding core Azure services	30-35%
Understand security, privacy, compliance, and trust	25-30%
Understand Azure pricing and support	25-30%

- 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.

Hands-On Components

- No labs or group structured hands on components in this course.
- Recorded *demos*, and step by step *walkthroughs* available throughout the course, and we would encourage you to follow, or attempt, some, or all, of these as you see fit.

- A *free Microsoft Azure account* is recommended. For help, see:
  - Create your free account today: azure.microsoft.com/free
  - Create a free Azure Account - Video Demo: youtu.be/H53yVpKB3_c

Module 01: Cloud concepts

Module 1 – Learning objectives

- Describe and understand cloud services and their benefits
- Understand key terms you will encounter when working with cloud services
- Understand public, private, and hybrid cloud models
- Understand infrastructure as a service (IaaS)
- Understand platform as a service (PaaS)
- Understand software as a service (SaaS)

Lesson 01: Why cloud services?

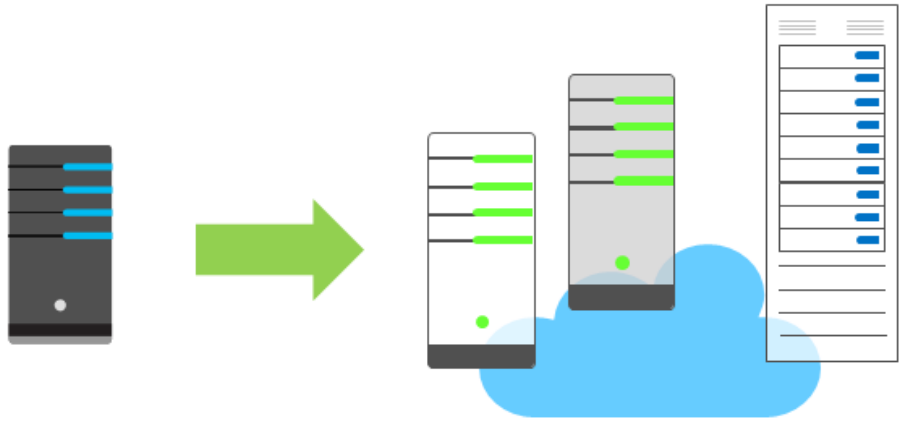
Key concepts and terms

- Cloud services have certain characteristics and considerations, such as:

High availability	Disaster recovery
Scalability	Global reach
Elasticity	Customer latency capabilities
Agility	Predictive cost considerations
Fault tolerance	Security

Economies of scale

- The concept of *economies of scale* is the ability to do things less expensively and more efficiently when operating at a larger scale in comparison to operating at a smaller scale.



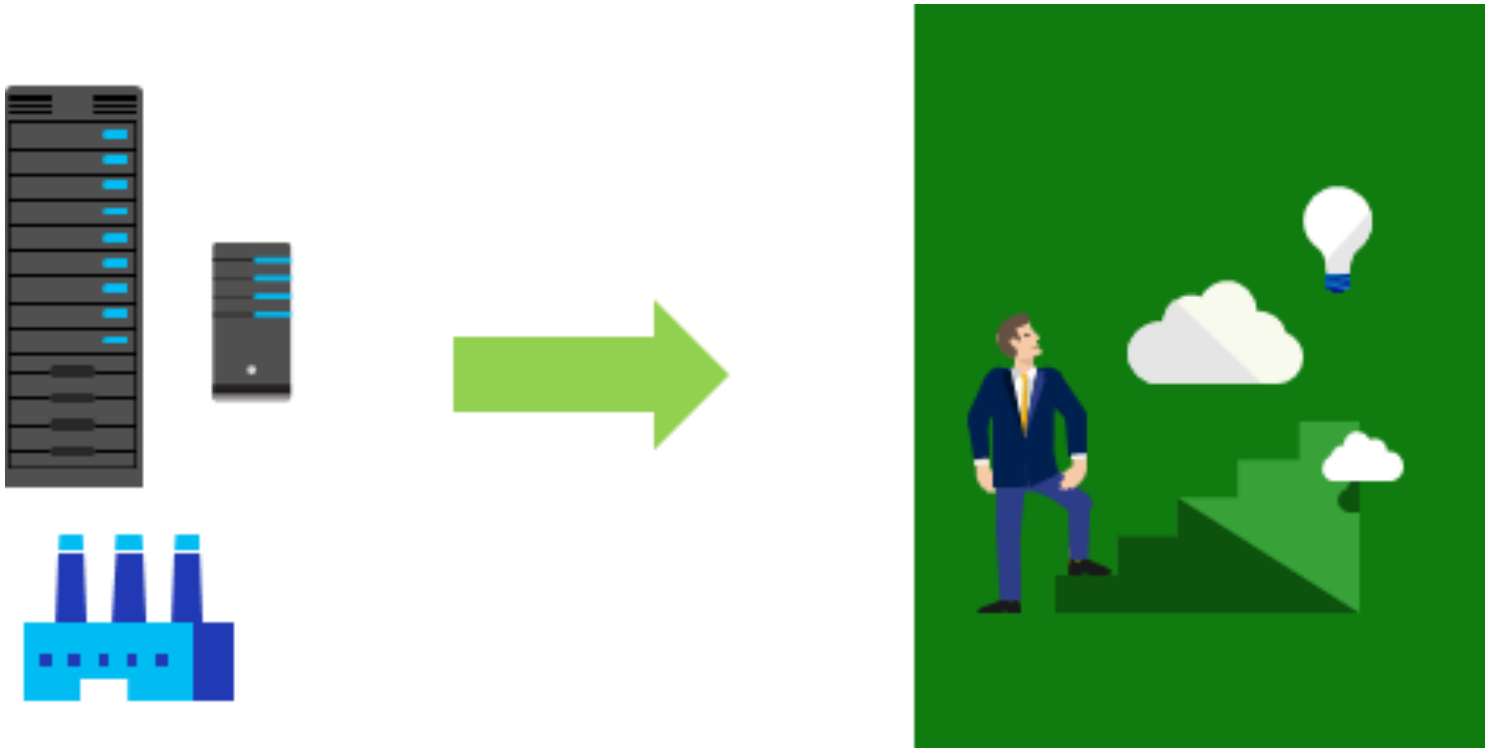
- Cloud providers such as Microsoft, Google, and Amazon Web Services (AWS) are very large businesses, and thus can leverage the benefits of economies of scale and then pass those benefits on to their customers.

CapEx vs. OpEx

- **Capital Expenditure (CapEx)** : spend on physical infrastructure up front, deduct the expense from your tax bill.
  - High upfront cost, value of investment reduces over time.

- **Operational Expenditure (OpEx)** : spend on services or products as needed, and get billed immediately. Deduct the expense from your tax bill in the *same year*.
  - No upfront cost, pay-as-you use.

Consumption-based model



Users only pay for the resources they use

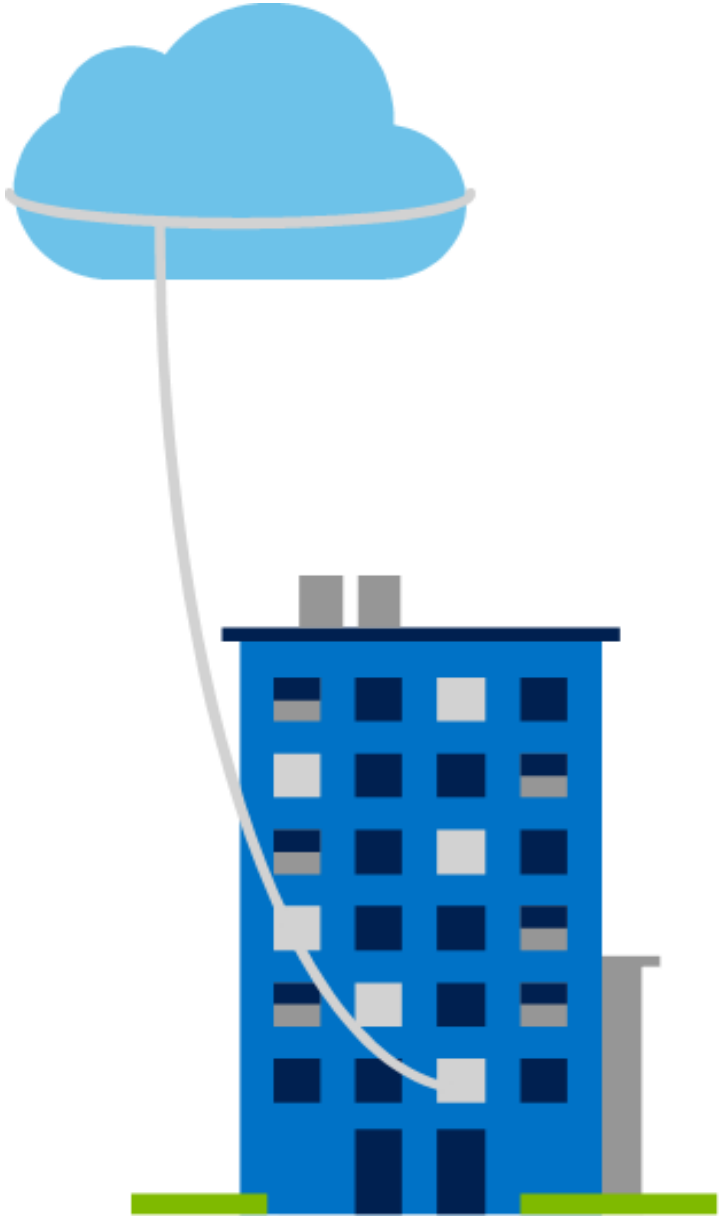
Lesson 02: Types of cloud models

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

- Owned and operated by the organization that uses cloud resources.
- Organizations create a cloud environment in their data center.
- Self-service access to compute resources provided to users within the organization.
- Organizations responsible for operating the services they provide.



Hybrid cloud

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

Cloud model comparison

Public cloud:

- No CapEx. You don’t have to buy a new server to scale up.
- Agility. Applications can be made accessible quickly, and deprovisioned whenever needed.
- Consumption-based model. Organizations pay only for what they use and operate under an OpEx model.

Private cloud:

- Control. Organizations have complete control over resources.
- Security. Organizations have complete control over security.

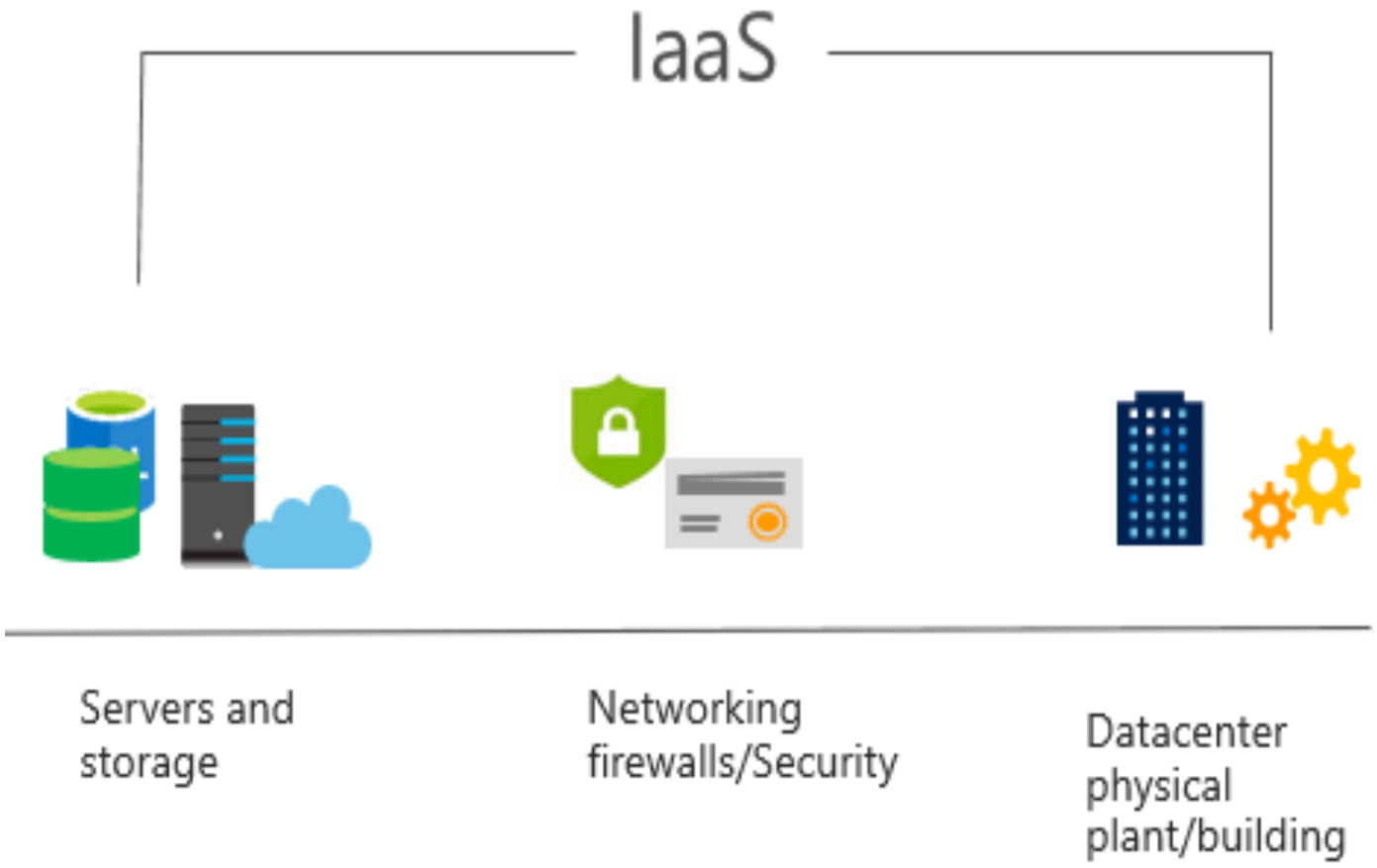
Hybrid cloud:

- Flexibility. The most flexible scenario. With a hybrid cloud setup, an organization can determine whether to run their applications in a private cloud or in a public cloud.
- Compliance. Organizations maintain the ability to comply with strict security, compliance, or legal requirements as needed.

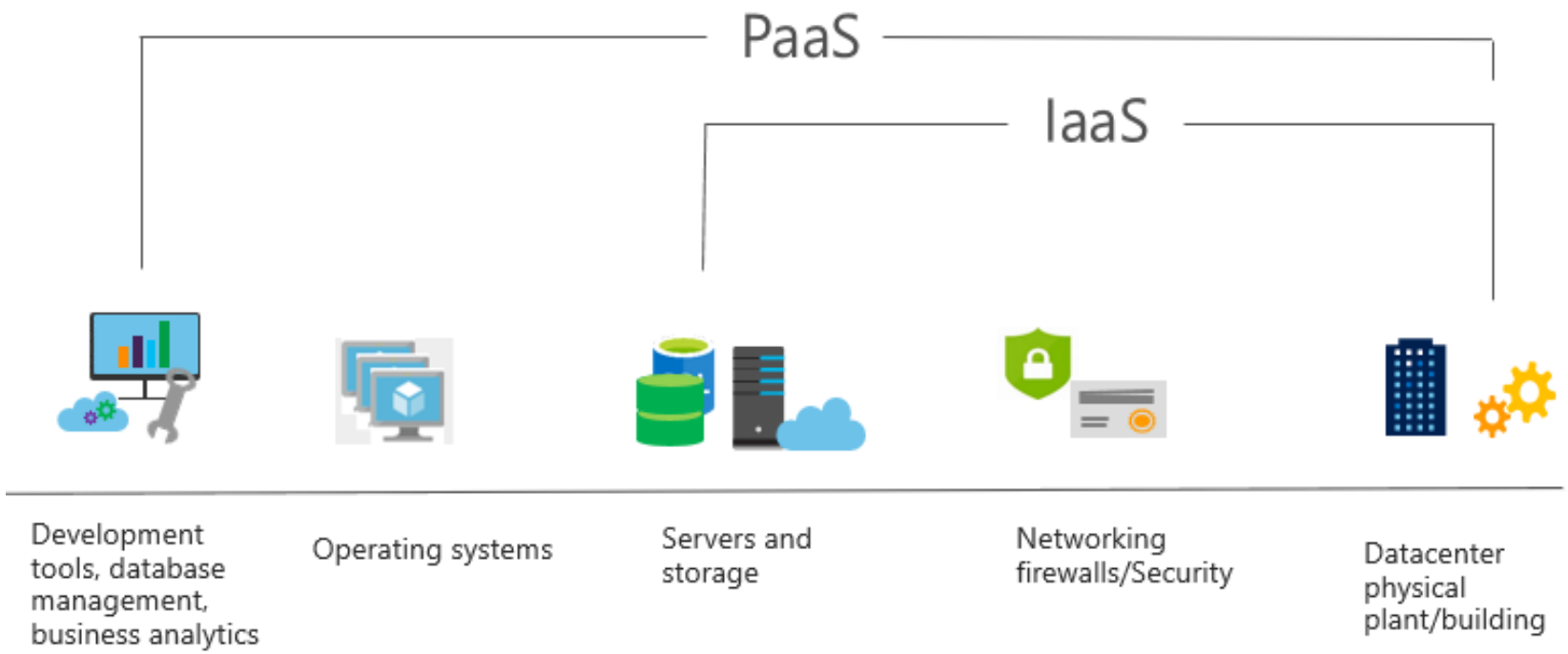
Lesson 03: Types of cloud services

Infrastructure as a Service (IaaS)

- Most basic cloud computing services category.
- Build pay-as-you-go IT infrastructure by renting servers, virtual machines, storage, networks, and operating systems from a cloud provider.
- Instant computing infrastructure, provisioned and managed over the internet.

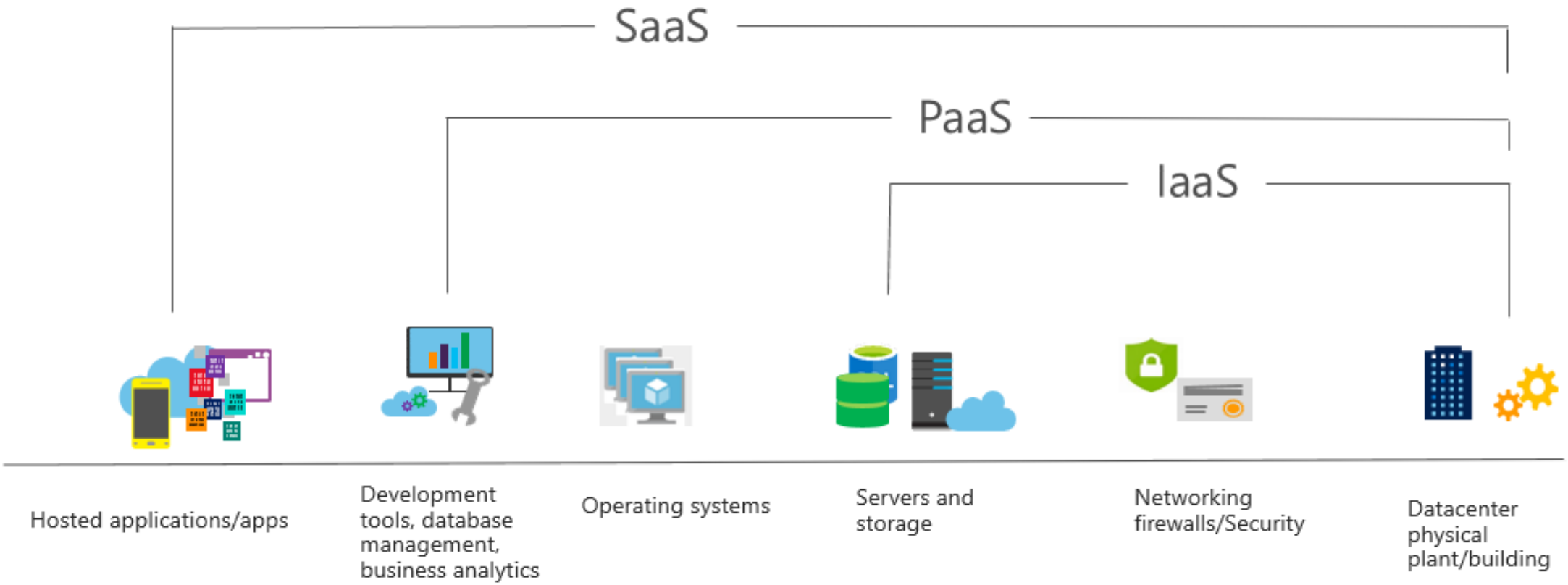


Platform as a Service (PaaS)



- Provides environment for building, testing, and deploying software applications.
- Helps create applications quickly, without focusing on managing underlying infrastructure.

Software as a Service (SaaS)



Centrally hosted and managed software for end users. Users connect to and use cloud-based apps over the internet. For example, Microsoft Office 365, email, and calendars.

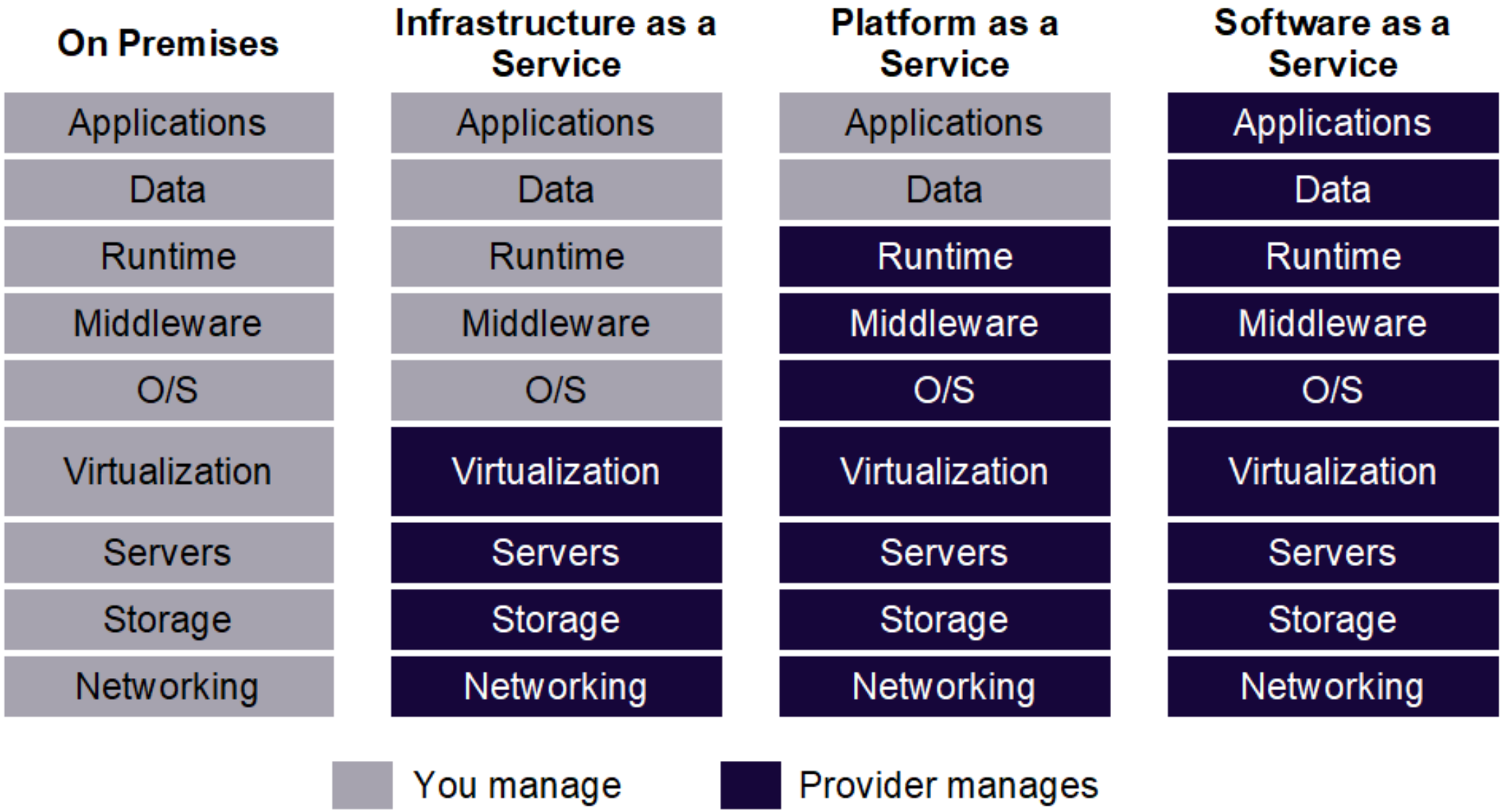
Cloud service comparison

- **IaaS:** Flexibility. IaaS is the most flexible cloud service as you have control to configure and manage the hardware running your application.

- **PaaS:** Productivity. Users can focus on application development only, as all platform management is handled by the cloud provider. Working with distributed teams as services is easier, as the platform is accessed over the internet and can be made globally available more easily.

- **SaaS:** Pay-as-you-go pricing model. Users pay for the software they use on a subscription model, typically monthly or yearly, regardless of how much they use the software.

Management responsibilities



Module 02:
Core Azure services

Module 2 – Learning objectives

- Understand and describe core Azure architectural components
- Understand and describe core Azure services and products
- Understand and describe Azure solutions
- Understand and describe Azure management tools

Lesson 01: Core Azure architectural components

Regions

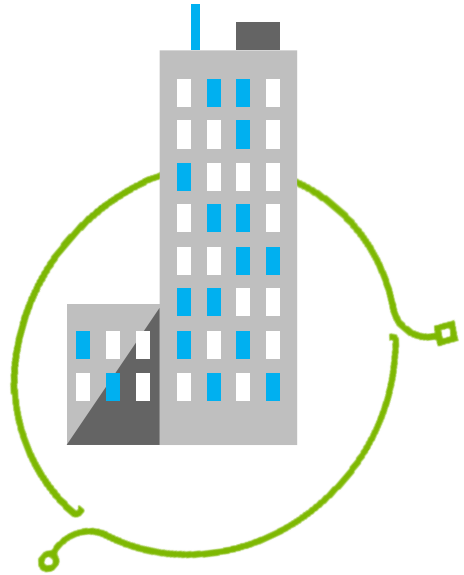
- Azure is made up of datacenters located around the globe. These datacenters are organized and made available to end users by country/region

- In reference to datacenters, a *region* is a geographical area on the planet containing at least one—but potentially multiple —datacenters that are in close proximity and networked together with a low-latency network

Regions - continued

Azure special regions

For applications with specific compliance or legal requirements.



- Azure Government (North America)
- Azure China 21Vianet
- Azure Germany

Region pairs

Each Azure region is paired with another region, within the same geography. Pairing replicates Azure resources to minimize service interruptions from natural disasters, power or network outages.

Geographies

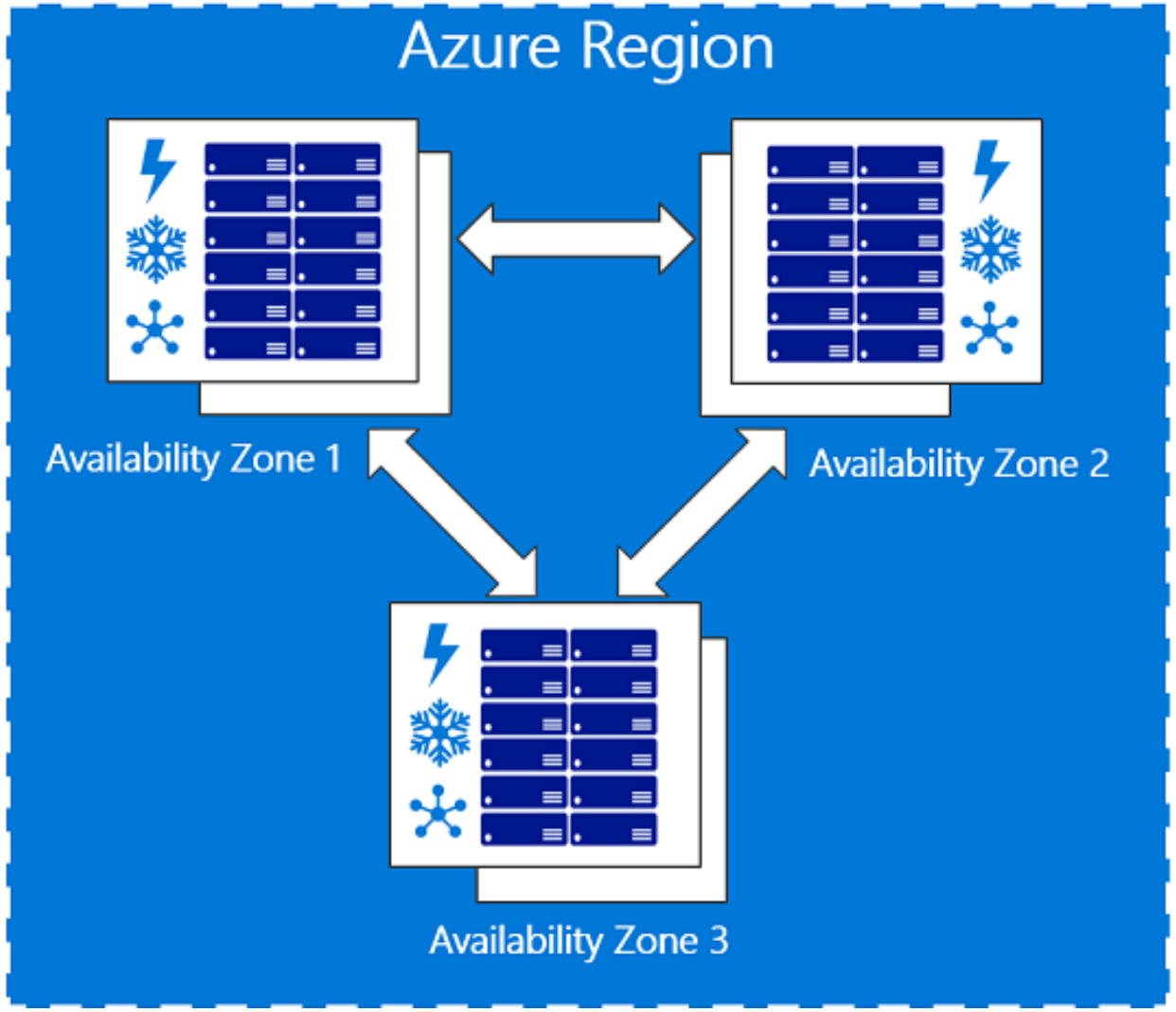
Discrete markets that preserve data residency and compliance boundaries.

Geography features:

- Typically contain two or more regions.
- Allow customers with specific data-residency and compliance needs to keep their data and applications in close proximity.
- Categorized as Americas, Europe, Asia Pacific, Middle East, and Africa.

Availability zones

- Physically separate locations within an Azure region.
- Made up of one or more datacenters, equipped with independent power, cooling, and networking.
- Act as an isolation boundary.
- If one availability zone goes down, the other continues working.

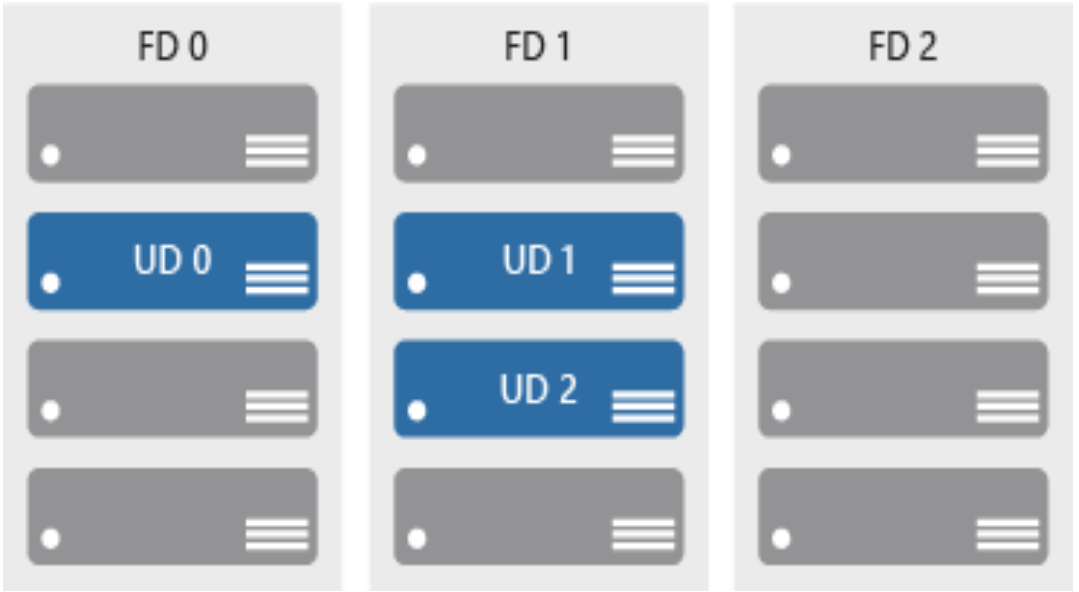


Availability sets

Keep applications online during maintenance or hardware failure.

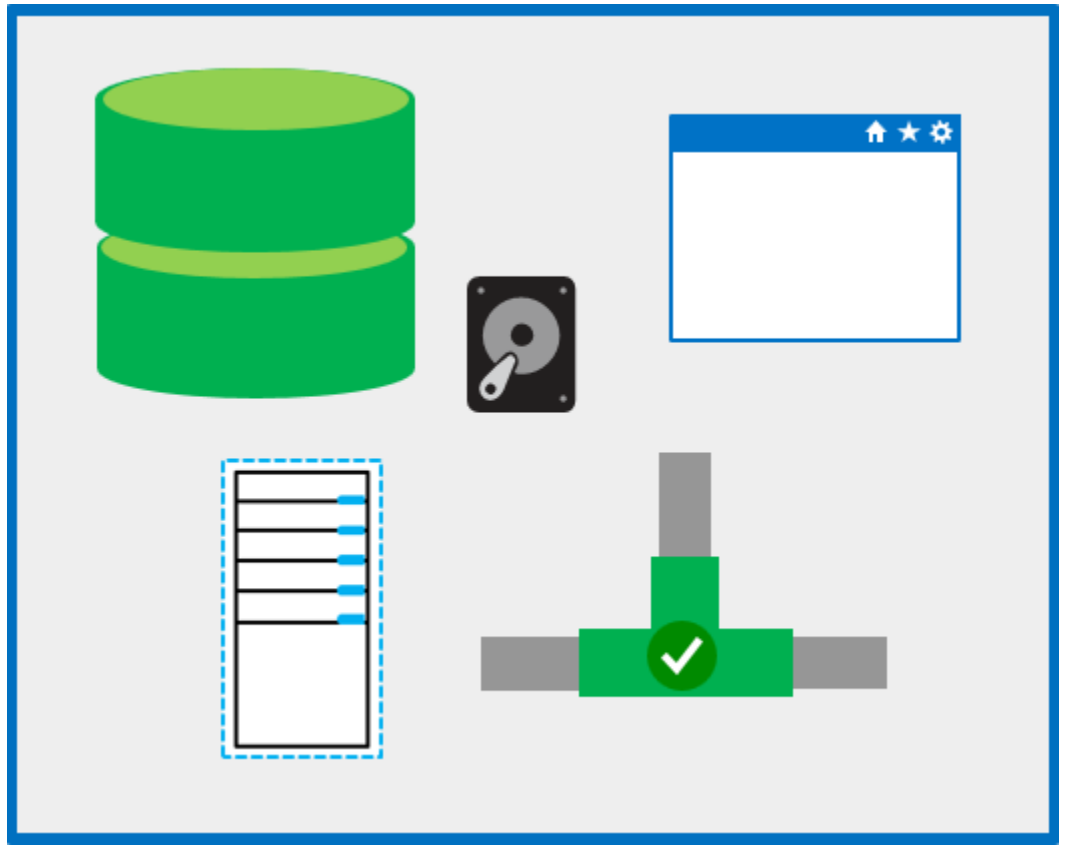
Comprised of:

- Update domains (UD): Scheduled maintenance, performance or security updates are sequenced through update domains.
- Fault domains (FD): Provide a physical separation of workloads across different hardware in a data center.



Resource groups

A unit of management for resources in Azure.



Resource group features:

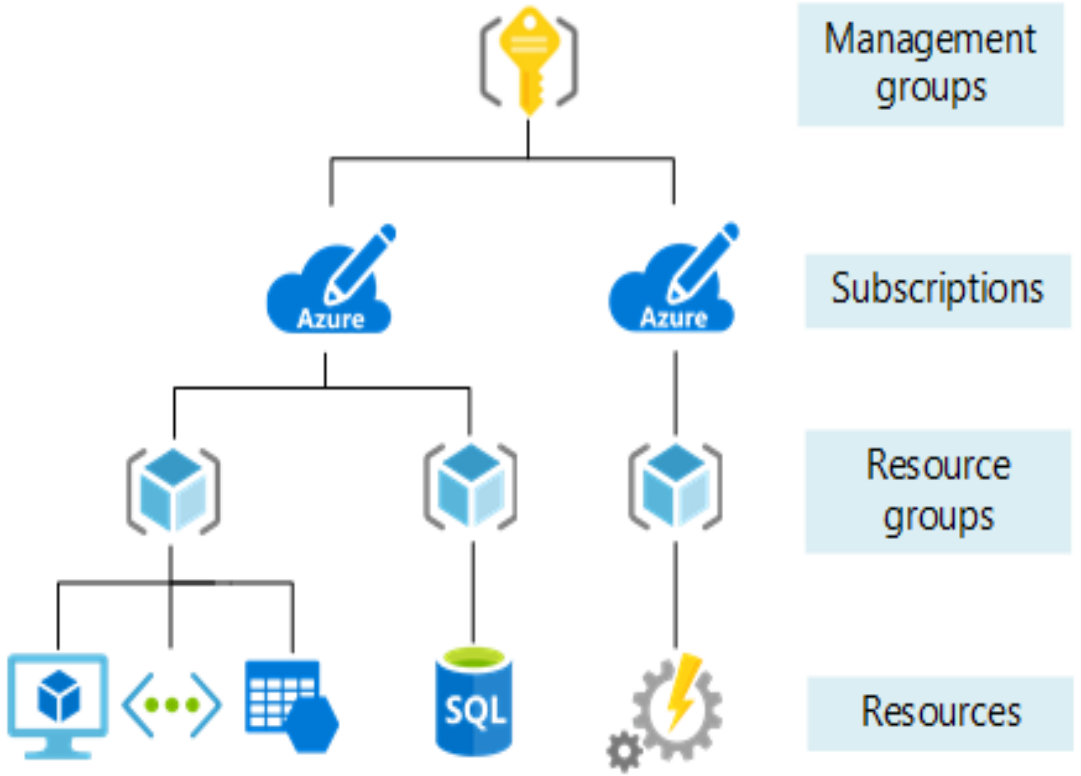
- Act as containers to aggregate the resources required by an application into a single, manageable unit.
- Every Azure resource must exist in one (and only one) Resource Group.

Azure Resource Manager

Provides a management layer in which resource groups and all the resources within it are created, configured, managed, and deleted

With Azure Resource Manager, you can:

- Create, configure, manage and delete resources and resource groups
- Organize resources
- Control access and resources
- Automate using different tools and SDKs



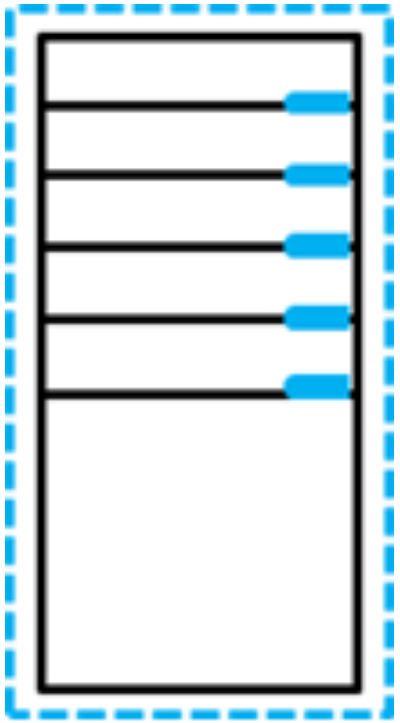
Lesson 02: Core Azure services and products

Azure compute services

On-demand computing service for running cloud-based applications.

Azure compute services features:

- provides computing resources such as disks, processors, memory, networking, and operating systems.
- makes resources available in minutes or seconds.
- pay-per-use.
- common on-demand Azure services are : (a) Virtual Machines, and (b) Containers.



Azure compute services - virtual machine services

VMs are software emulations of physical computers. Examples of Azure services for virtual machines include:

- **Azure VMs:** Infrastructure as a service (IaaS) to create and use VMs in the cloud
- **VM scale sets:** Designed for automatic scaling of identical VMs

- **App services:** Platform as a service (PaaS) offering to build, deploy, and scale enterprise-grade web, mobile, and API apps
- **Functions:** Creates infrastructure based on an event

Azure compute services – container services

Containers are a virtualization environment. However, unlike virtual machines, they do not include an operating system. Containers are meant to be lightweight, and are designed to be created, scaled out, and stopped dynamically. Examples of Azure services for containers include:

- Azure Container Instances: A PaaS offering that allows you to upload your containers, which it then will run for you

- Azure Kubernetes Service: A container orchestrator service for managing large numbers of containers

Azure network services

Networking on Azure allows you to connect cloud and on-premises infrastructure and services.

- **Azure Virtual Network**: Provides secure communication between Azure resources

- **Azure Load Balancer**: Allows for the management of traffic to and from applications and services.

- **VPN Gateway**: Provides for secure traffic between Azure Virtual Networks and on-premises locations over the public internet

- **Azure Application Gateway**: Provides for the management of traffic to web applications

- **Content Delivery Network**: Provides for efficient delivery of web content to geographically dispersed users.

Azure storage services – data categories

Structured data	Semi-structured data	Unstructured data
Adhere to a schema, with same data fields or properties.	Ad hoc schema. Less organized fields and properties than structured data.	No designated schema or data structure.
Storable in relational database tables, with rows and columns.	Non-relational or NoSQL data, not storable in tables, rows and columns.	Non-relational or blob data, with no restrictions on kinds of data blobs contain.
Examples include, sensor or financial data.	Books, blogs, and HTML documents are examples of semi-structured data.	For example, a blob can hold a PDF, JPG, JSON object, or video.

Azure storage services – Azure services

Azure Storage is a service that you can use to store files, messages, tables, and other types of information.

- **Blob storage:** No restrictions on the kinds of data it can hold. Blobs are highly scalable
- **Disk storage:** Provides disks for virtual machines, applications, and other services
- **File storage:** Azure Files offers fully-managed file shares in the cloud
- **Archive storage:** Storage facility for data that is rarely accessed

Azure database services

Azure database services are fully-managed PaaS database services that free up valuable time you'd otherwise spend managing your database

- Azure Cosmos DB: A globally-distributed database service that enables you to elastically and independently scale throughput and storage

- Azure SQL Database: A relational database as a service (DaaS) based on the latest stable version of the Microsoft SQL Server database engine

- Azure Database Migration: A fully-managed service designed to enable seamless migrations from multiple database sources to Azure data platforms with minimal downtime

Azure Marketplace

Connects end users with Microsoft partners, Independent Software Vendors (ISVs), and start-ups that offer solutions and services for Azure.

Azure customers, IT professionals and cloud developers can find, try, purchase, and provision Azure applications and services from certified service providers.

Includes close to 10,000 product listings.

Lesson 03: Azure solutions

Internet of Things

The internet allows any item that's online-capable to access valuable information. This ability for devices to garner and then relay information for data analysis is referred to as the *Internet of Things* (IoT)

- Microsoft IoT Central: A fully-managed global IoT software as a service (SaaS) solution that makes it easy to connect, monitor, and manage your IoT assets at scale

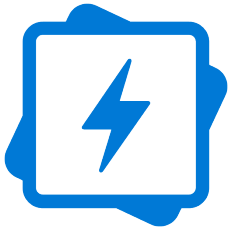
- Azure IoT Hub: A managed service hosted in the cloud that acts as a central message hub for bidirectional communication between your IoT application and the devices it manages

Big data and analytics

Big data refers to large volumes of data that become increasingly hard to make sense of, or consequently make decisions about. Some big data and analytic services in Azure include:

- Azure SQL Data Warehouse: A cloud-based Enterprise Data Warehouse that leverages massively parallel processing (mpp) to run complex queries quickly across petabytes of data

- Azure HDInsight: A fully-managed, open-source analytics service for enterprises. It is a cloud service that makes it easier, faster, and more cost-effective to process massive amounts of data



- Azure Data Lake Analytics: An on-demand analytics job service that simplifies big data. Instead of deploying and tuning hardware, you write queries to transform your data and extract valuable insights.

Artificial Intelligence

Artificial Intelligence (AI), in the context of cloud computing, is based around a broad range of applications, including Machine Learning, which use existing data to forecast future behaviors, outcomes, and trends. Using machine learning, computers learn without being explicitly programmed. Some AI services in Azure include:

- Azure Machine Learning service: Provides a cloud-based environment used to develop, train, test, deploy, manage, and track machine learning models

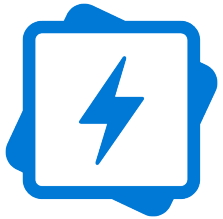
- Azure Machine Learning Studio: A collaborative, drag-and-drop visual workspace where you can build, test, and deploy machine learning solutions without needing to write code

Serverless computing

Serverless computing is a cloud-hosted execution environment that runs your code but abstracts the underlying hosting environment. Some serverless services in Azure include:

- Azure Functions: Concerned with the code running your service and not the underlying platform or infrastructure. Creates infrastructure based on an event.

- Azure Logic Apps: A cloud service that helps you automate and orchestrate tasks, business processes, and workflows when you need to integrate apps, data, systems, and services across enterprises or organizations.



- Azure Event Grid: A fully-managed, intelligent event routing service that uses a publish-subscribe model for uniform event consumption.

DevOps

DevOps allows you to create build and release pipelines that provide continuous integration, delivery, and deployment for applications.

- **Azure DevOps services:** Provides development collaboration tools including pipelines, Git repositories, Kanban boards, and extensive automated and cloud-based load testing.
- **Azure DevTest Labs**: Allows you to quickly create environments in Azure while minimizing waste and controlling cost

Lesson 04: Azure management solutions

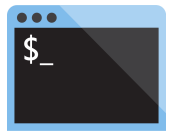
Azure management tools

Configure and manage Azure using a broad range of tools and platforms.

Azure management tools include:

- Azure Portal : Management website accessed via a web browser.

- Azure PowerShell : Command shell scripting language.



- Azure Command-Line Interface (CLI) : Cross-platform, command-line scripting program for Windows, Linux, or MacOS.

- Azure Cloud Shell : Browser-based scripting environment.

Module 03:

Security, privacy, compliance, and trust

Module 3 – Learning objectives

- Understand and describe how to secure network connectivity in Microsoft Azure.
- Understand and describe core Azure identity services.
- Understand and describe security tools and features.
- Understand and describe Azure governance methodologies.
- Understand and describe monitoring and reporting in Azure.
- Understand and describe privacy, compliance, and data protection standards in Azure.

Lesson 01: Securing network connectivity in Azure

Azure Firewall

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

Azure Firewall features :

- applies inbound and outbound traffic filtering rules.
- built-in high availability.
- unrestricted cloud scalability.
- uses Azure Monitor logging.

Azure Distributed Denial of Service (DDoS) protection

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

Azure DDoS Protection features :

- sanitizes unwanted network traffic, before it impacts service availability.
- basic service tier is automatically enabled in Azure.
- standard service tier adds mitigation capabilities, tuned to protect Azure Virtual Network resources.

Network security groups (NSGs)

Filters network traffic to, and from, Azure resources on Azure Virtual Networks.

Network security group features :

- 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.

Application Security Groups

Provides for the grouping of servers with similar port filtering requirements, and group together servers with similar functions, such as web servers

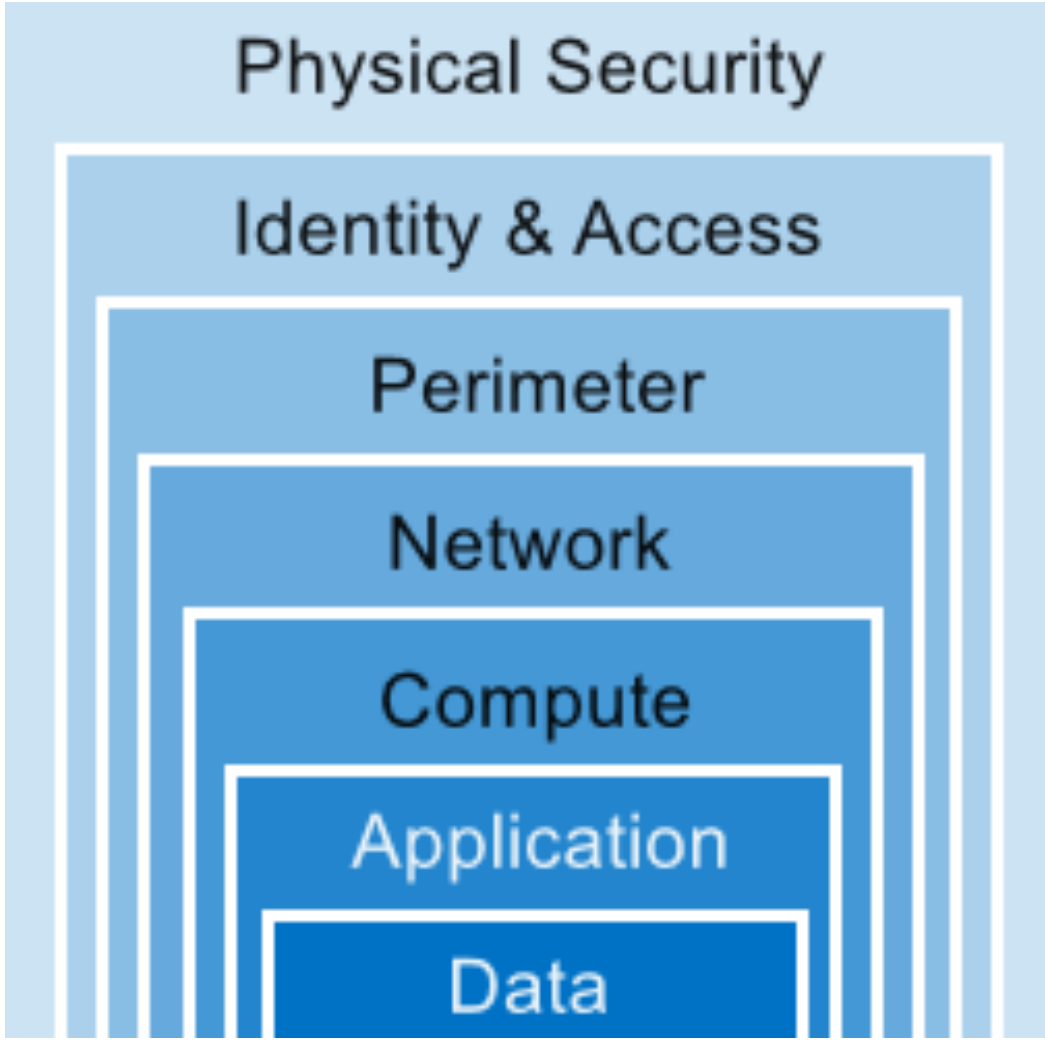
Application security group features :

- Allows you to reuse your security policy at scale without manual maintenance of explicit IP addresses
- handles the complexity of explicit IP addresses and multiple rule sets, allowing you to focus on your business logic

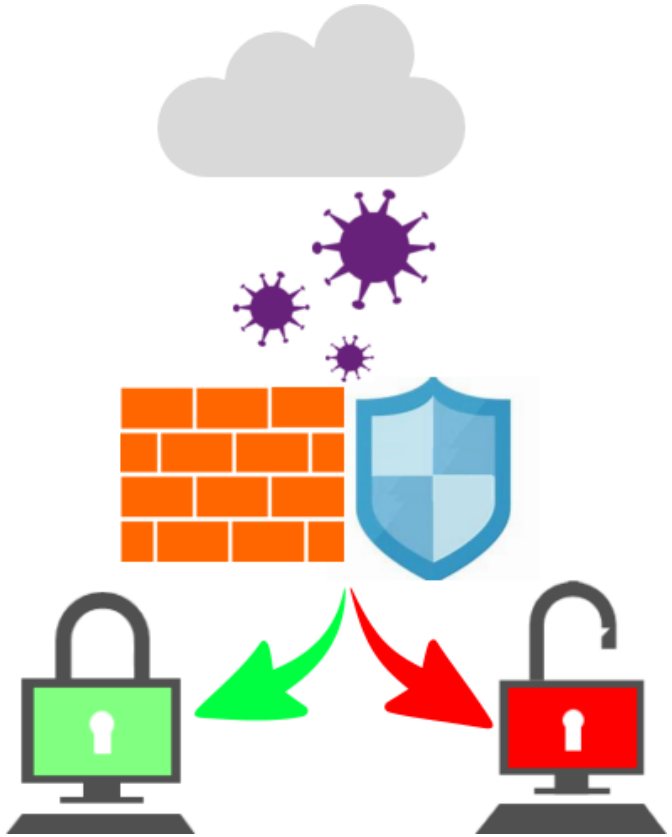
Defense in Depth

A layered approach to securing computer systems.

- Provides multiple levels of protection.
- Attacks against one layer are isolated from subsequent layers.



Choosing Azure network security solutions



- **Perimeter layer**: protect your networks' boundaries with Azure DDoS Protection and Azure Firewall.
- **Networking layer**: only permitted traffic should pass between networked resources with Network Security Group (NSG) inbound and outbound rules.

Azure supports combined network security solutions. For example, NSGs with Azure Firewall; Web Application Firewall (WAF) with Azure Firewall.

Shared responsibility

Migrating from customer-controlled to cloud-based data centers 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

Lesson 02: Core Azure identity services

Authentication and authorization

Two concepts are fundamental to understanding identity and access.

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 Active Directory (AD)

Microsoft Azure's cloud-based identity and access management service.

Services provided by Azure AD include :

- authentication (employees sign-in to access resources)
- single sign-on (SSO)
- application management

- Business to Business (B2B) and Business to Customer (B2C) identity services

Azure Multi-Factor Authentication

Provides additional security for your identities by requiring two or more elements for full authentication. These elements fall into three categories:

- ***Something you know**:*
- ***Something you possess**:*
- ***Something you are**:*

Lesson 03: Security tools and features

Azure Security Center

A monitoring service that provides threat protection across all your Azure, and on-premises, services.

Azure Security Center features :

- provides security recommendations based on your configurations, resources, and networks.
- monitors security settings across your on-premises and cloud workloads.
- automatically applies your security policies to any new services you provision.

Azure Security Center usage scenarios

- You can use Security Center in the D*etect*, *Assess*, and *Diagnose* stages of an incident response.

- Use Security Center recommendations to enhance security.

Azure Key Vault

Stores application secrets in a centralized cloud location, to securely control access permissions, and access logging.

Use Azure Key Vault for :

- secrets management.
- key management.
- certificate management.
- storing secrets backed by hardware security modules (HSMs).

Azure Information Protection (AIP)

Classifies and protects documents, and emails, by applying labels.

AIP labels can be applied :

- automatically using rules and conditions defined by administrators.
- manually, by users.
- by combining automatic and manual methods, guided by recommendations.

Azure Advanced Threat Protection (Azure ATP)

Cloud-based security solution for identifying, detecting, and investigating advanced threats, compromised identities, and malicious insider actions.

Consists of Azure ATP :

- **Portal** : dedicated portal for monitoring and responding to suspicious activity.
- **Sensors** : installed directly onto your domain controllers.
- **Cloud service** : runs on Azure infrastructure.

Lesson 04: Azure governance methodologies

Azure Policy

Stay compliant with your corporate standards and service level agreements (SLAs) by using policy definitions to enforce rules and effects for your Azure resources.

Azure Policy features :

- 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.

Policies : Example policy definitions

Allowed Storage Account size

- conditions and rules define acceptable sizes for new storage accounts.
- requests to create storage accounts outside the defined sizes are denied.

Allowed Locations

- defines the Azure locations where your organization can deploy resources, to enforce geographic compliance requirements.
- requests to deploy resources outside the defined locations are denied.

More Azure Policy examples :

docs.microsoft.com/azure/governance/policy/samples/

Initiatives

Initiatives work alongside policies in Azure Policy.

- **Initiative definitions** : Group multiple policy definitions into a single unit, to track compliance at greater/ macro-level scope.

  For example, one initiative can monitor all of your Azure Security Center recommendations.

- **Initiative assignments** : Initiative definitions that are assigned to a specific scope. Initiative assignments reduce the need to make an initiative definition for each scope.

Role-based access control (RBAC)

Fine-grained access management control over your Azure resources.

Available to *all* Azure subscribers, at no additional cost.

Example uses of Azure RBAC :

- Grant specific access rights to particular users for certain jobs. One user can manage VMs, while another manages virtual networks.
- Allocate particular database types to certain database administration groups.

Locks

Protect your Azure resources from accidental deletion or modification .

Manage locks at subscription, resource group, or individual resource levels within Azure Portal.

	User Actions		
Lock Types	**Read**	**Update**	**Delete**
CanNotDelete	Yes	Yes	No
ReadOnly	Yes	No	No

Azure Advisor security assistance

Get personalized advice and recommendations to improve and enhance security.

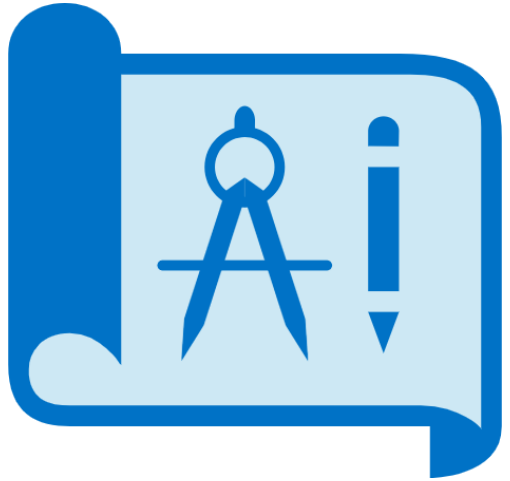
- Integrates with Azure Security Center to provide in-depth security recommendations.
- View recommendations in the Azure Advisor dashboard.

Azure Blueprints

Create reusable environment definitions that can recreate your Azure resources and apply your policies instantly.

Use Azure Blueprints to:

- help audit and trace your deployments, and maintain compliance using built-in tools and artifacts.
- associate blueprints with specific Azure DevOps build artifacts, and release pipelines, for rigorous tracking.



Subscription governance

There are mainly three aspects to consider in relation to creating and managing subscriptions:

- *Billing*: Reports and chargeback can be generated per subscriptions
- *Access Control*: A subscription is a deployment boundary for Azure resources and has the ability to set up role-based access control (RBAC
- *Subscription Limits*: Subscriptions are also bound to some hard limitations. If there is a need to go over those limits in particular scenarios, then additional subscriptions may be needed. If you hit a hard limit, there is no flexibility.

Lesson 05: Monitoring and reporting in Azure

Tags

You can apply tags to your Azure resources providing metadata to logically organize them into a taxonomy such as an organization structure, workload, geography or any other logical grouping.

Each tag consists of a name and a value pair

Name	Value
Environment	Production
Department	IT

- Tags are useful when you need to organize resources for billing or management.

Azure Monitor

Collect, analyse, and act on telemetry from cloud and on-premises environments, to maximize your applications' availability and performance.

- starts collecting data as soon as you create an Azure subscription and add resources.

- *Activity Logs* record all resource creation and modification events.

- *Metrics* measure resource performance and consumption.

- add an Azure monitor agent to collect operational data for a resource.

Azure service health

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

Components of Azure service health :

- **Azure Status** : provides a global overview Azure services' state of health.
- **Service Health** : customizable dashboard for tracking the state of services in the regions you use.
- **Azure Resource Health** : diagnose and obtain support for Azure service issues affecting your resources.

Monitoring applications and services

Integrate Azure Monitor with other Azure services to improve your data monitoring capabilities, and gain better insights into your operations.

Analyze	Use variants of Azure Monitor for resources (containers, virtual machines, etc.), with Azure Application Insights for applications.
Respond	Azure Alerts can respond proactively to critical conditions identified in your monitor data, and use Auto-scale with Azure Monitor Metrics.
Visualize	Use Azure Monitor data to create interactive visualizations, charts, and tables with Power BI.
Integrate	Integrate Azure Monitor with other systems to build customized solutions to suit your needs and requirements.

Lesson 06: Privacy, compliance and data protection standards in Azure

Compliance Terms and Requirements

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

CJIS (Criminal Justice Information Services)	**HIPAA** (Health Insurance Portability and Accountability Act)
CSA STAR Certification	**ISO/IEC 27018**
General Data Protection Regulation (GDPR)	**National Institute of Standards and Technology (NIST)**

You can view all the Microsoft compliance offerings at Microsoft Compliance Center - Compliance Offerings.

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 :

- which data Microsoft process,
- how Microsoft processes it,
- and for what purposes.

Review Microsoft's Privacy Statement at :

microsoft.com/privacystatement

Trust Center : microsoft.com/trustcenter

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

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, legal teams, and more.

Service Trust Portal (STP) : servicetrust.microsoft.com

A Trust Center companion website for compliance-related publications about Microsoft cloud services. Hosts the Compliance Manager service.

Use STP to access :

- audit reports across Microsoft cloud services.
- guides to using Microsoft cloud services for regulatory compliance.
- publications about trust, and how Microsoft cloud services protect your data.

Compliance Manager

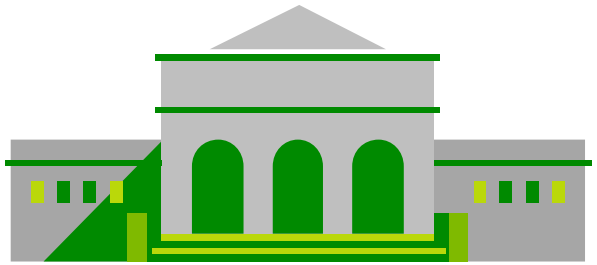
Workflow-based, risk assessment tool in Trust Portal that supports your organization's regulatory compliance activities.

Compliance Manager features :

- assign, track, and verify your compliance and assessment-related activities.
- provides a score by evaluating your compliance status.
- stores and manages your compliance-related artifacts in a secure digital repository.

Azure Government services

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



Azure Government :

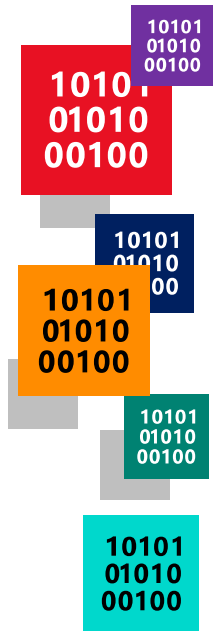
- separate instance of Azure.
- physically isolated from non-US government deployments.
- accessible only to screened, authorized personnel.

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

Azure Germany services

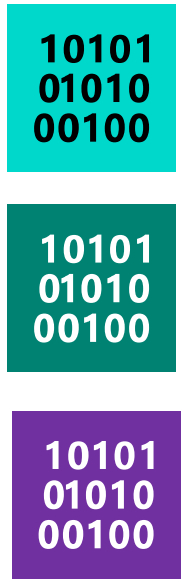
Meets strict data protection, access, and control requirements under German law. Features of Azure Germany include:

- customer data and supporting systems reside in German data centers.
- data centers are managed by an independent, German data trustee.
- data replication confined to German data centers to support business continuity.
- anyone who requires data to reside in Germany can use this service



Azure China 21Vianet

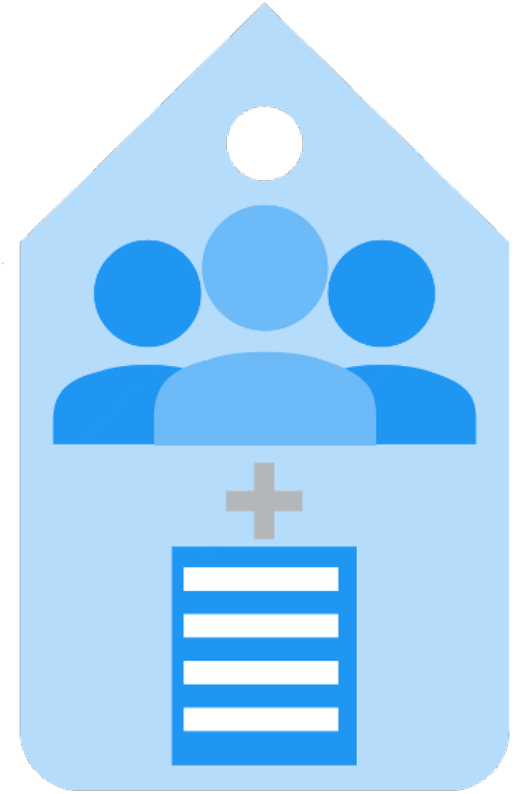
China’s first foreign public cloud service provider, in compliance with government regulations.



Azure China 21Vianet features :

- physically separated instance of Azure cloud services, located in China.
- operated by 21Vianet (Azure China 21Vianet).

Module 04:
Azure pricing and support



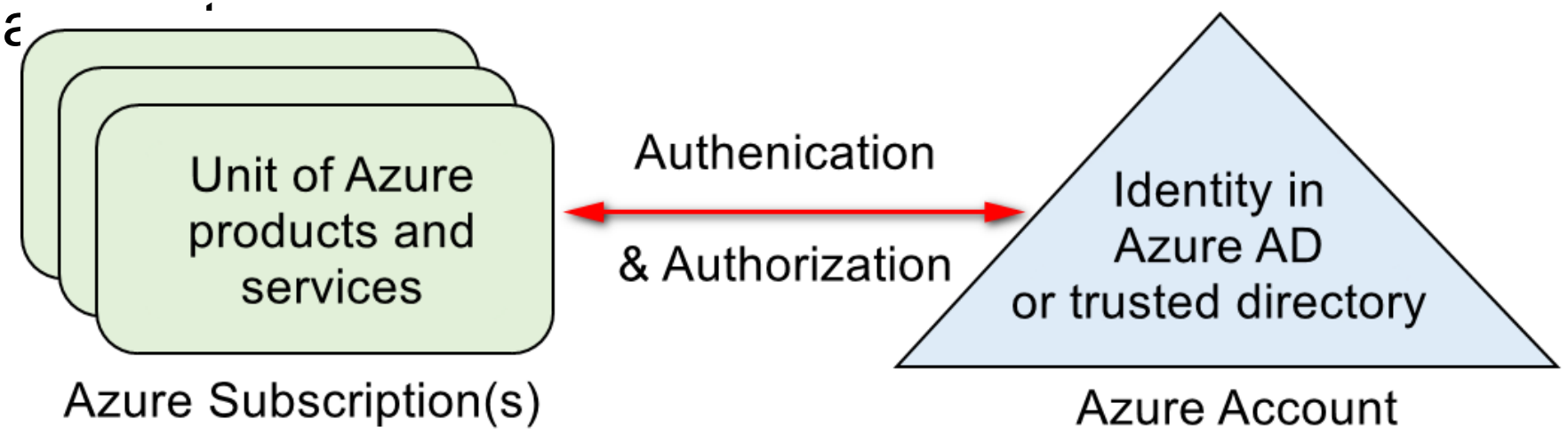
Module 4 – Learning objectives

- Understand and describe Microsoft Azure subscriptions and management groups
- Recognize ways to plan and manage Azure costs
- Understand Azure support options
- Understand and describe features of Azure Service Level Agreements (SLAs)
- Understand and describe the service lifecycle in Azure

Lesson 01: Azure subscriptions

Azure subscriptions

- An Azure subscription provides you with authenticated and authorized access to Azure products and services and allows you to provision resources on Azure. It is a logical unit of Azure services that links to an Azure a



- Azure offers free and paid subscription options to suit different needs and requirements. An account can have one subscription or multiple subscriptions that have different billing models, and to which you apply different access-management policies.

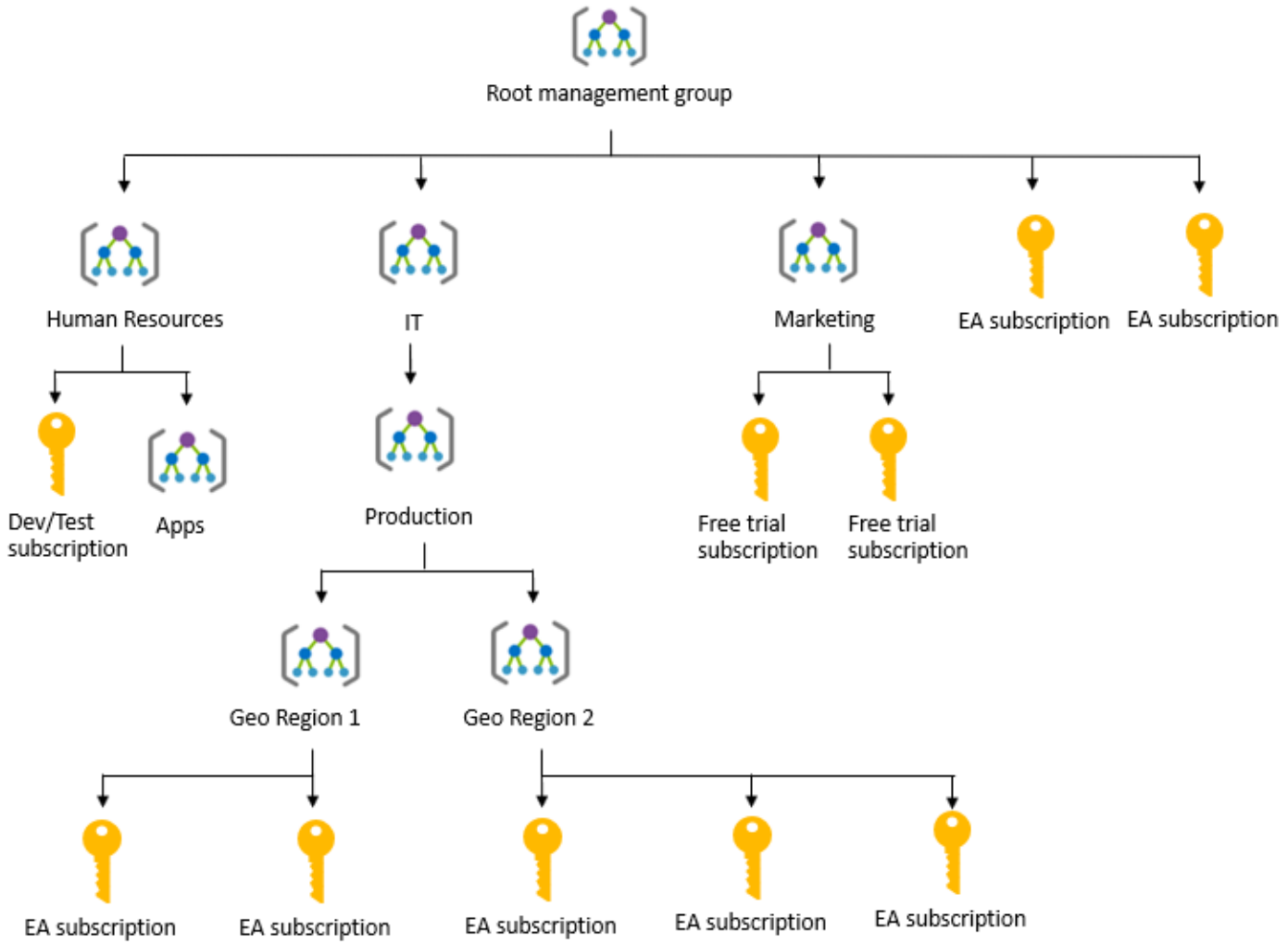
Subscription uses and options

- You can use Azure subscriptions to define boundaries around Azure products, services, and resources.
- Two types of subscription boundaries that you can use:
  - Billing boundary. This subscription type determines how an Azure account is billed for using Azure. You can create multiple subscriptions for different types of billing requirements.
  - Access control boundary. Azure will apply access management policies at the subscription level, and you can create separate subscriptions to reflect different organizational structures.
- Several other subscription types to choose from include the Free account and Pay-As-You-Go.

Management groups

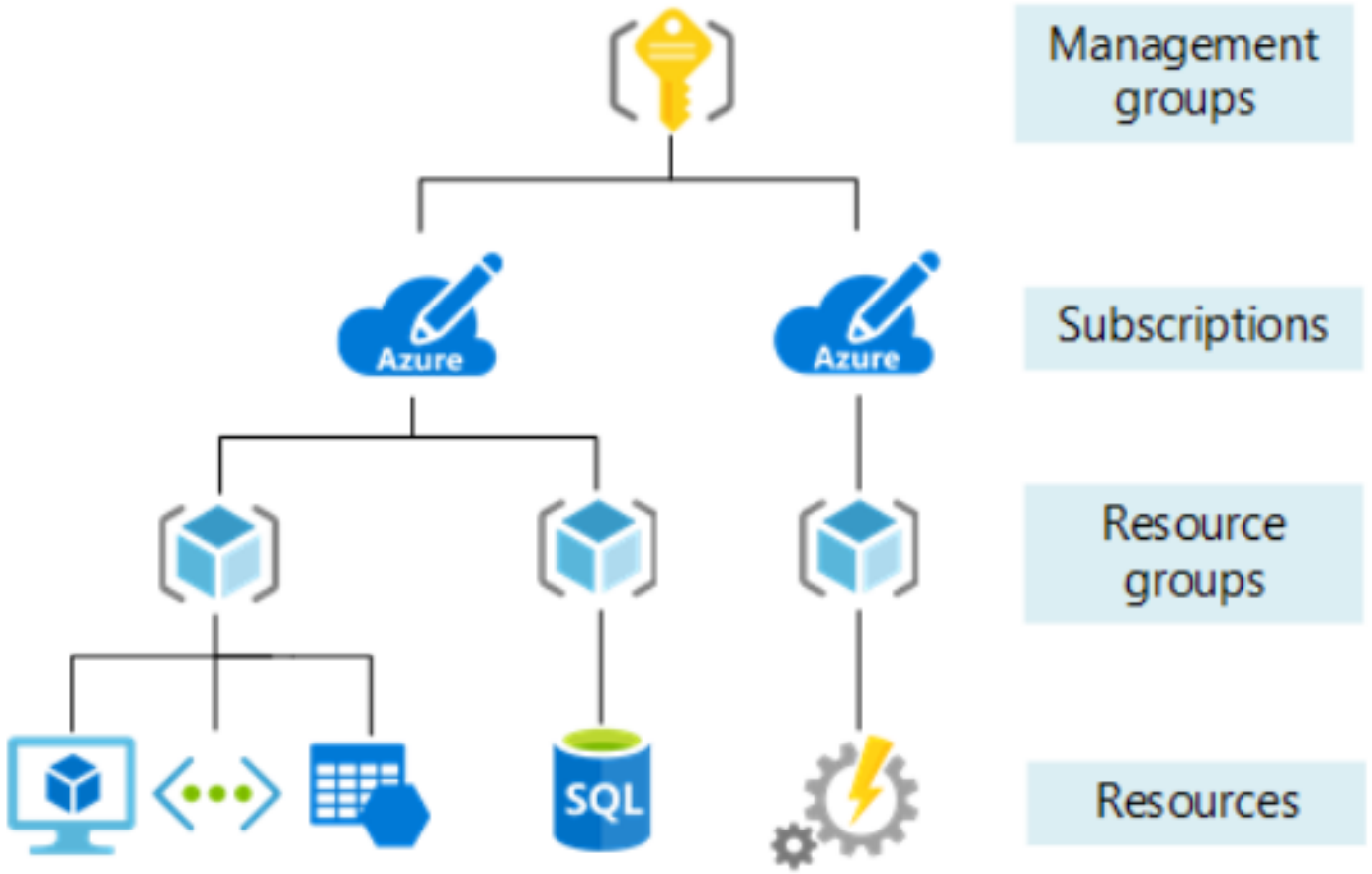
- *Azure Management groups* are containers for managing access, policies, and compliance across multiple Azure subscriptions

- *Management groups* allow you to order your Azure resources hierarchically into collections, which provide a further level of classification beyond subscriptions.



Object Hierarchy

The organizing structure for resources in Azure has four levels:



Lesson 02: Planning and managing costs

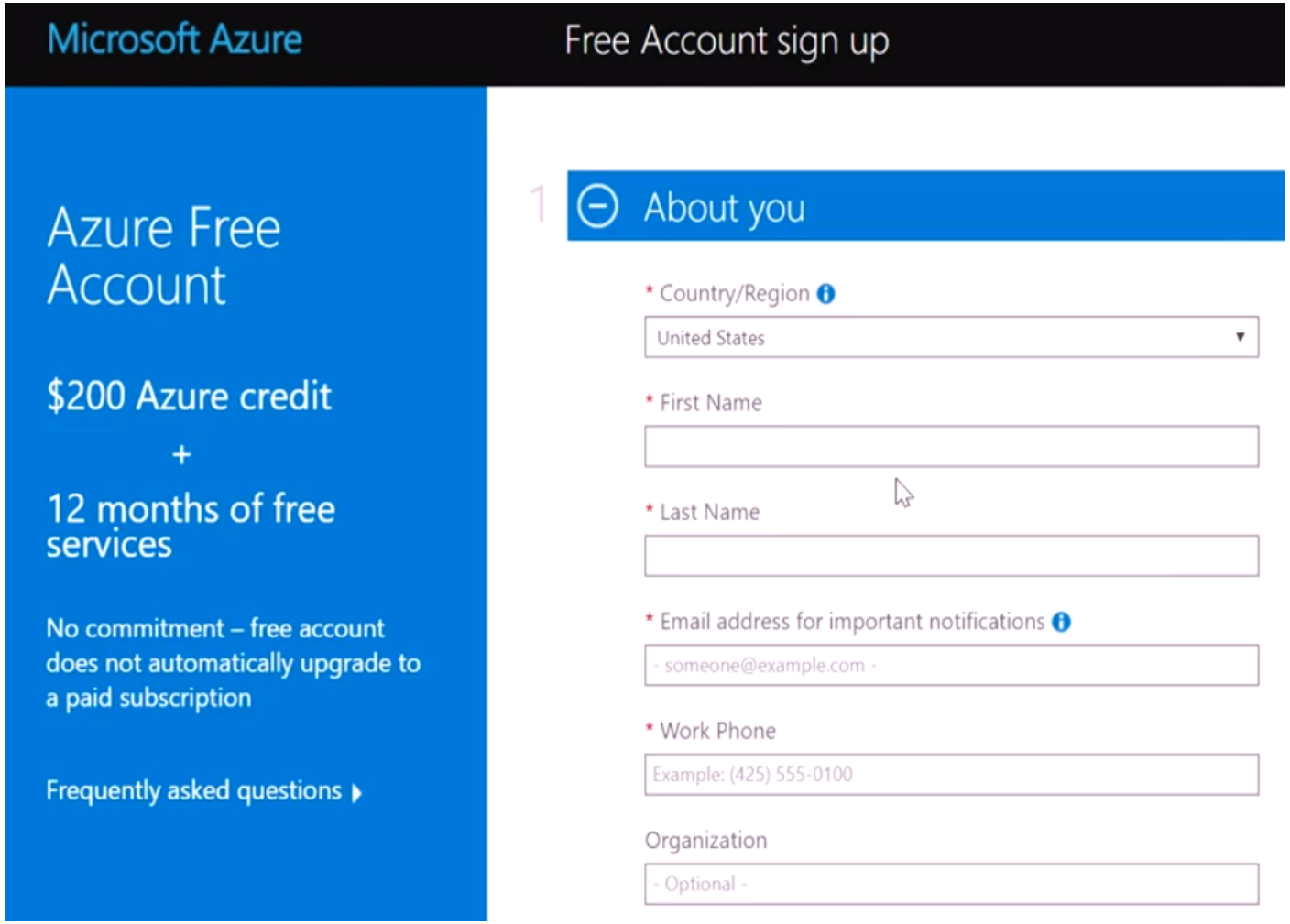
Purchasing Azure products and services

- Three main customer types on which the available purchasing options for Azure products and services are contingent are:
  - **Enterprise**: Enterprise customers sign an Enterprise Agreement with Azure that commits them to spending a negotiated amount on Azure services, which they typically pay annually.
  - **Web direct**: Web direct customers sign up for Azure through the Azure website.
  - **Cloud solution providers (CSPs):** Typically are Microsoft partner companies that a customer hires to build solutions on top of Azure. Payment and billing for Azure usage occurs through the customer's CSP.

- Products and services in Azure are arranged by category, such as compute and networking, which have various resources that you can provision.

Azure free account

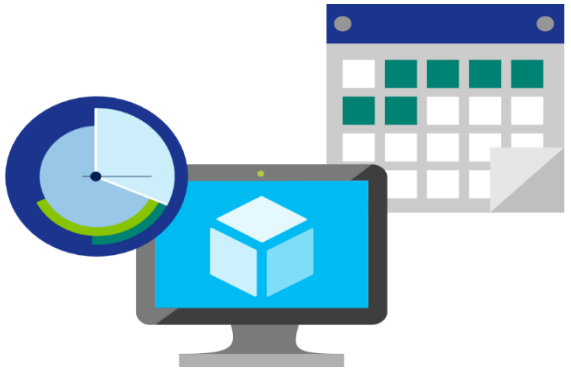
- An *Azure free account* provides subscribers with a $200 USD Azure credit that they can use for paid Azure products during a 30-day trial period.
- Once you use that $200 USD credit or reach your trial's end, Azure suspends your account unless you sign up for a paid account.



Factors affecting costs

There are three primary factors affect costs:

- **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.
- **Services**: Azure usage rates and billing periods can differ between Enterprise, Web Direct, and CSP customers.
- **Location**: The Azure infrastructure is globally distributed, and usage costs might vary between locations that offer particular Azure products, services, and resources.



Zones for Billing Purposes

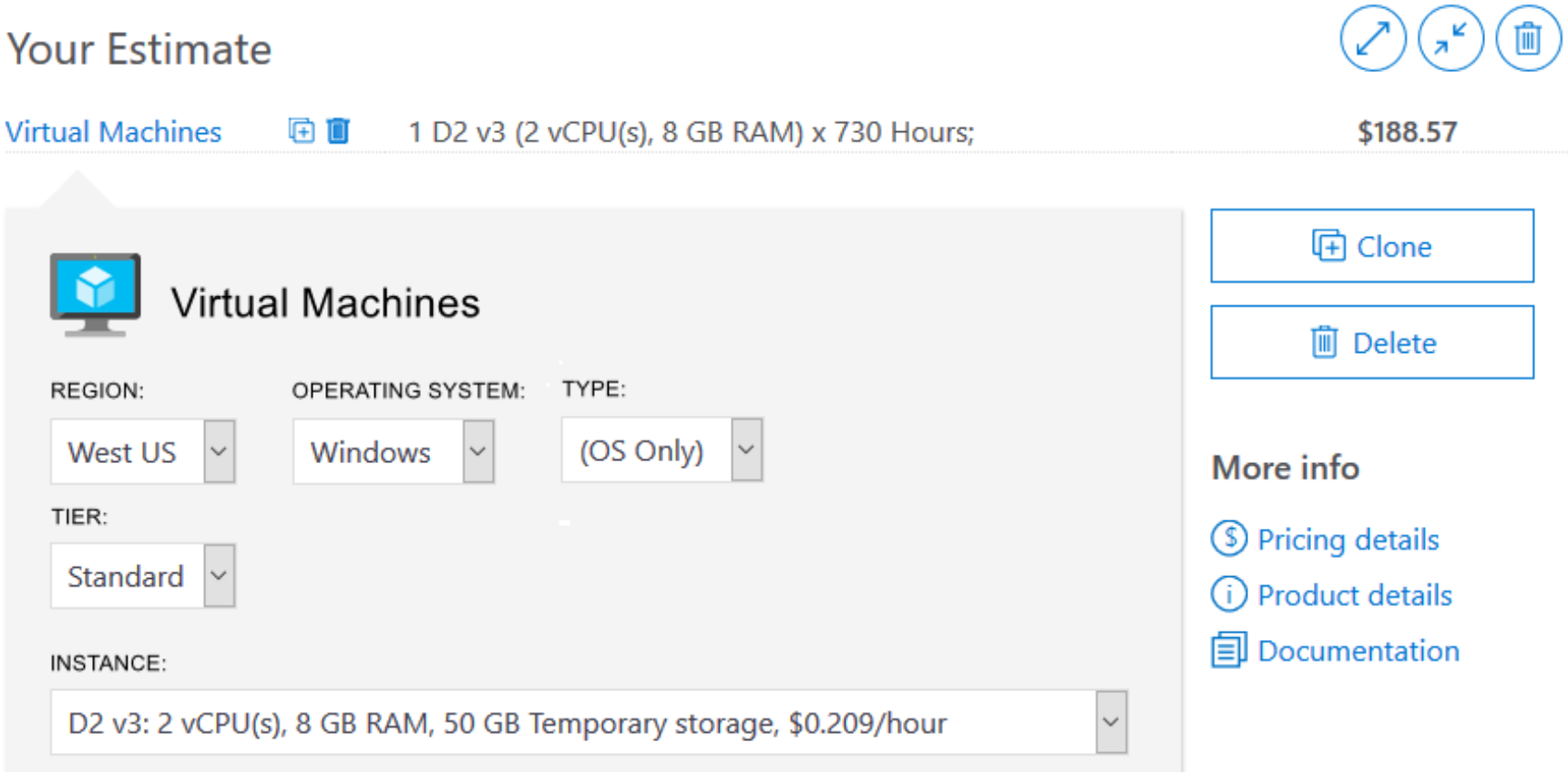
- *Bandwidth* refers to data moving in and out of Azure datacenters. Some inbound data transfers are free, such as data going into Azure datacenters. For outbound data transfers—such as data going out of Azure datacenters—pricing is based on Zones.

- A *zone* is a geographical grouping of Azure Regions for billing purposes. Zones are:
  - Zone 1. Includes West US, East US, West Europe, and others.
  - Zone 2 . Includes Australia Central, Japan West, Central India, and others.
  - Zone 3. Includes Brazil South only.
  - DE Zone 1. Includes Germany Central and Germany Northeast.

Pricing calculator

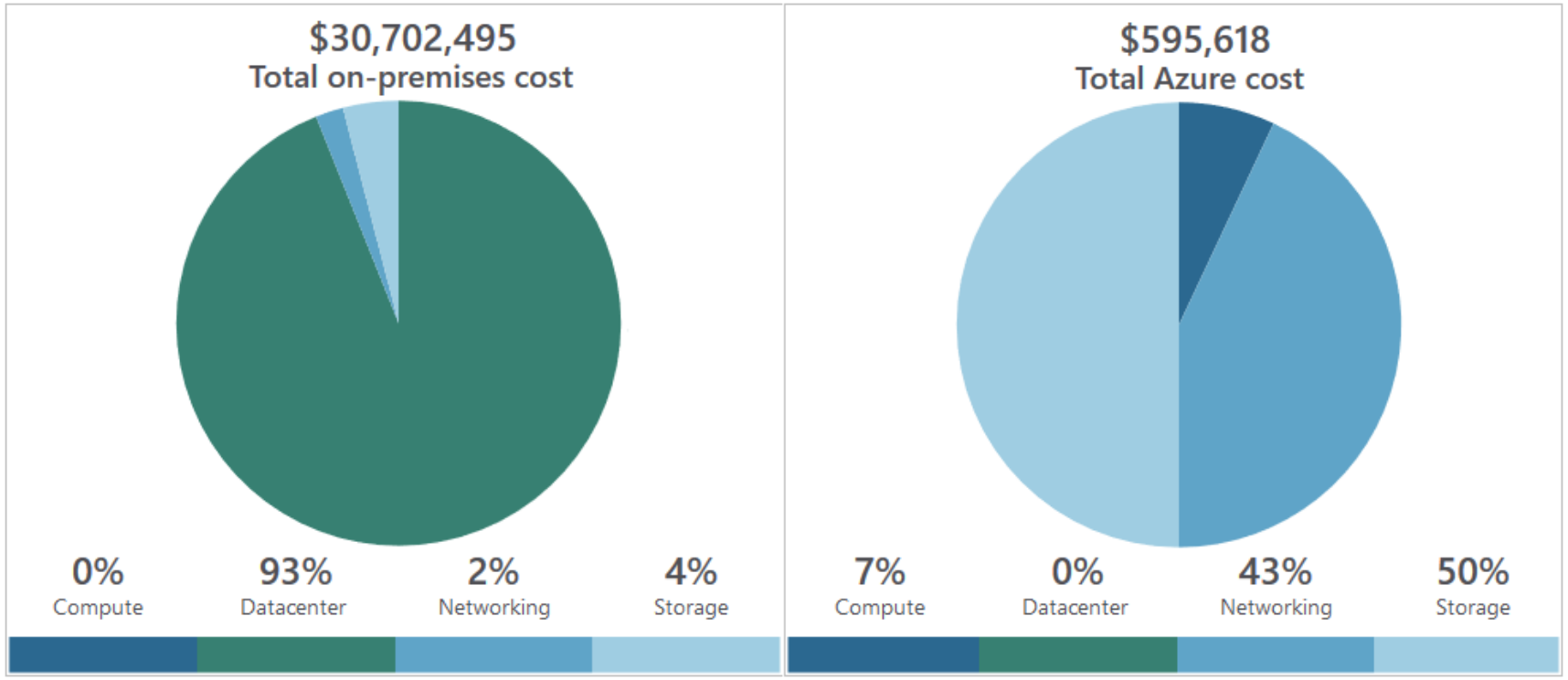
- Helps you estimate the you need and configure them according to your specific requirements

- Azure provides a detailed estimate of the costs associated with your selections and configurations



Total cost of ownership (TCO) calculator

- A tool that you use 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 to host infrastructure in the cloud



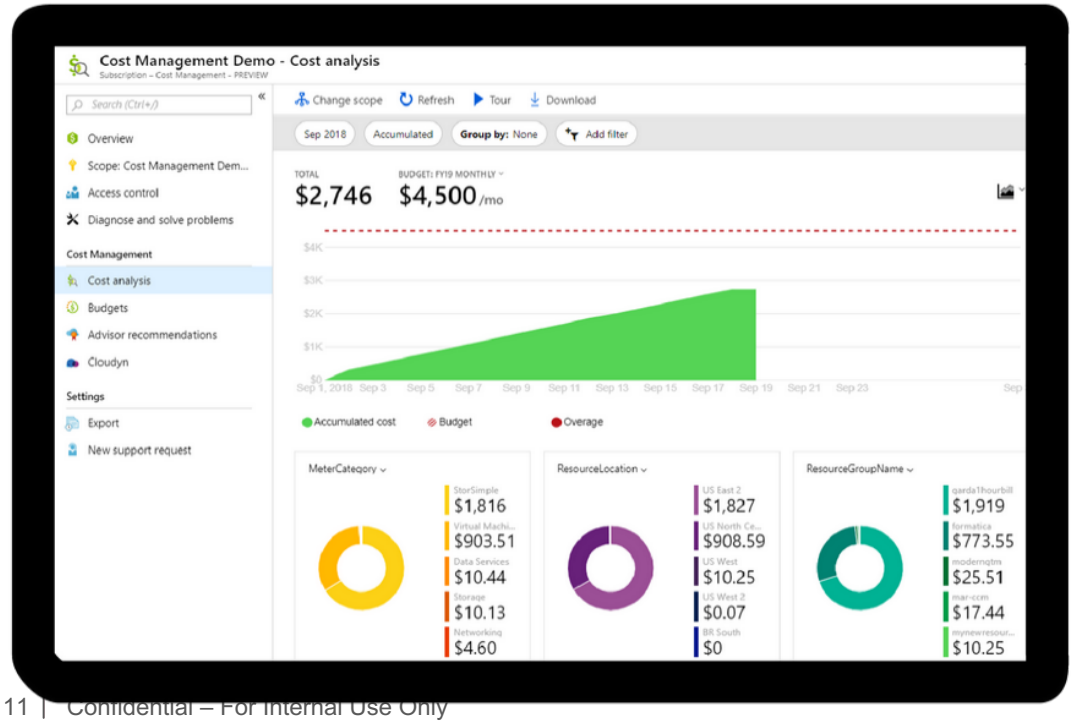
Minimizing costs

The following best practice guidelines can help minimize your Azure costs:

- **Perform cost analyses:** Use the Azure Pricing and TCO calculators
- **Monitor usage with Azure Advisor:** Implement recommendations
- **Use spending limits:** Use via free trial customers and some credit-based Azure subscriptions
- **Use Azure Reservations:** To get a discount, reserve products and resources by paying in advance. Prepay for 1 or 3 years, and achieve up to 72% savings over pay-as-you-go costs
- **Choose low-cost locations and regions:** If possible, use low-cost locations
- **Apply tags to identify cost owners:** Identify usage owners with tags

Azure Cost Management

Azure Cost Management is an Azure product that provides a set of tools for monitoring, allocating, and optimizing Azure costs, it provides the following:



- **Reporting**: Generates reports
- **Data enrichment**: Improves accountability by categorizing resources with tags
- **Budgets**: Monitors resource demand trends, consumption rates, and cost patterns
- **Alerting**: Provides alerts based on your cost and usage budgets
- **Recommendations**: Provides recommendations to eliminate idle resources and to optimize provisioned Azure resources

Lesson 03: Support options available with Azure

Support plan options

- Every Azure subscription includes:
  - Free access to billing and subscription support
  - Azure products and services documentation
  - Online self-help documentation
  - Community support forums

- Paid Azure support plans:
  - *Developer*. For Azure use in trial and nonproduction environments
  - *Standard*. Appropriate for Azure use in production environments
  - *Professional Direct*. Appropriate for organizations with business-critical dependence on Azure
  - *Premier.* Ideal for organizations with substantial dependence on Microsoft products, including Azure.

Alternative support channels

- Other support channels available outside of the Azure official support plans:
  - Microsoft Developer Network (MSDN) Azure Forums.
  - Stack Overflow
  - Server Fault
  - Azure Feedback Forum Microsoft Azure general feedback
  - Twitter. Tweet @AzureSupport to get answers and support

Knowledge Center

- *Azure Knowledge Center* is a searchable database that contains support questions and answers from a community of Azure experts, developers, customers, and users
- Browse through all answers within the Azure Knowledge Center by entering keyword search terms into the text-entry field and further refine your search results by selecting products or tags from the dropdown lists
- See Azure Knowledge Center for more information

Lesson 04: Azure Service Level Agreements (SLAs)

Service Level Agreements (SLAs)

- SLAs document the specific terms that define Azure performance standards

- SLAs define Microsoft's commitment to an Azure service or product
- Individual SLAs are available for each Azure product and service
- SLAs also define what happens if a service or product fails to meet the designated availability commitments

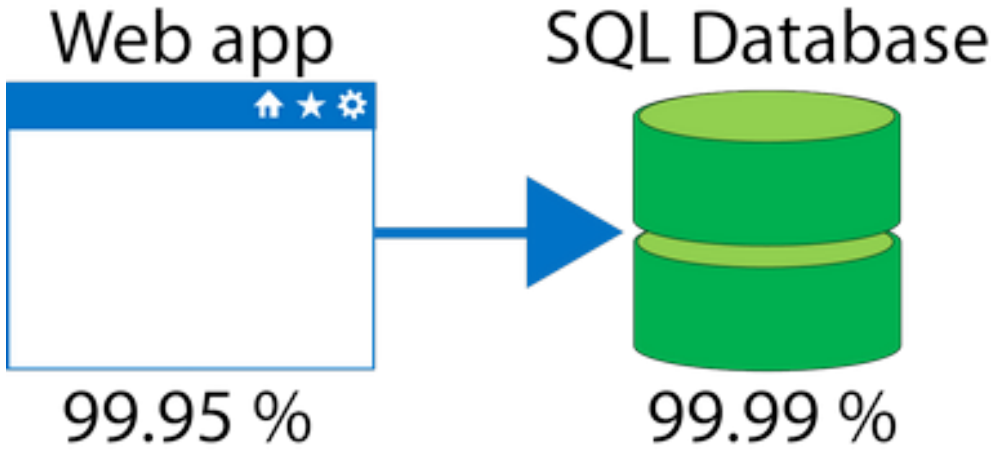
SLAs for Azure products and services

- Three key characteristics of SLAs for Azure products and services:
  - Performance targets, uptime and connectivity guarantees: Uptime or connectivity rates, such as availability
  - Performance targets range: Typical SLAs specify performance-target commitments ranging from 99.9 percent (*three nines*) to 99.99 percent (*four nines*)
  - Service credits: Percentage of the applicable monthly service fees credited to you if a service fails to meet ALS uptime guarantee
- For more information about specific Azure SLAs for individual products and services, see Service Level Agreements

Composite SLAs

- At the time of this writing, an App Service web app that writes to Azure SQL Database has the following SLAs:
  - App Service Web Apps is 99.95 percent
  - SQL Database is 99.99 percent

- Question: What is the maximum downtime you would expect for this application, as across?
- Answer: The composite SLA for this application is 99.95% × 99.99% = 99.94%.



- This is lower than the individual SLAs. However, you can construct SLAs to improve overall application SLA.

Improving application SLAs

- Azure customers can use SLAs to evaluate how their Azure solutions meet their business requirements, and the needs of their clients and users. By creating their own SLAs, organizations can set performance targets to suit their specific Azure application. This is known as an *application SLA*.

- Considerations for defining application SLAs:
  - **Self Healing**: Your Azure solution should be self-diagnosing and self-healing
  - **Response Time**: Responding to failures quickly enough to meet SLA performance targets above four 9's are difficult to meet
  - **Realistically Achievable**: The smaller the time window for recovery (for example, hourly or daily) the tighter the tolerances and higher the cost

Improving application SLAs - *continued*

The following table lists the potential cumulative downtime for various SLA levels over different durations

SLA	Downtime per week	Downtime per month	Downtime per year
99%	1.68 hours	7.2 hours	3.65 days
99.9%	10.1 minutes	43.2 minutes	8.76 hours
99.95%	5 minutes	21.6 minutes	4.38 hours
99.99%	1.01 minutes	4.32 minutes	52.56 minutes
99.999%	6 seconds	25.9 seconds	5.26 minutes

Lesson 05: Service lifecycle in Azure

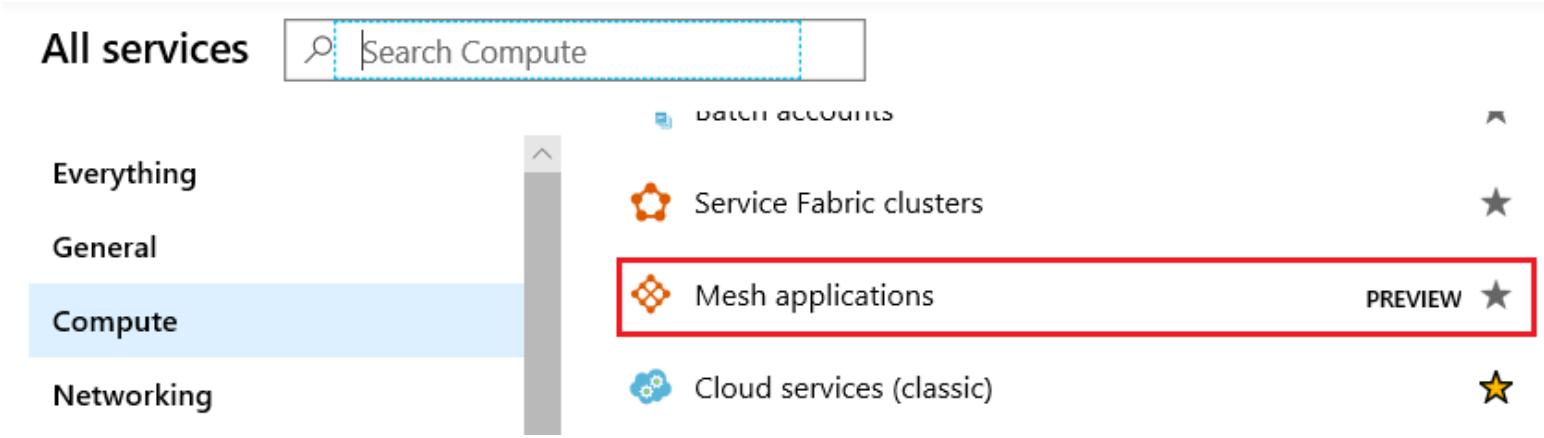
Public and private preview features

- Microsoft offer previews of Azure features for evaluation purposes.
- With Azure previews, you can test beta and other pre-release features, products, services, software, and regions.
- There are two types of Azure preview modes:
  - **Private Preview**: An Azure feature is available to certain Azure customers for evaluation purposes
  - **Public Preview**: An Azure feature is available to all Azure customers for evaluation purposes

Accessing preview features

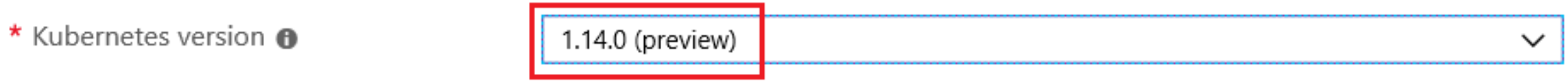
Preview - New Services:

- Accessible via the Azure Portal
- Indicated by the presence of a **Preview** label on the service



Preview - New Functionality/Features within an existing service:

- Some preview features are accessible as you deploy, configure and manage an existing service for example Azure Kubernetes cluster version



Accessing Azure Portal Preview

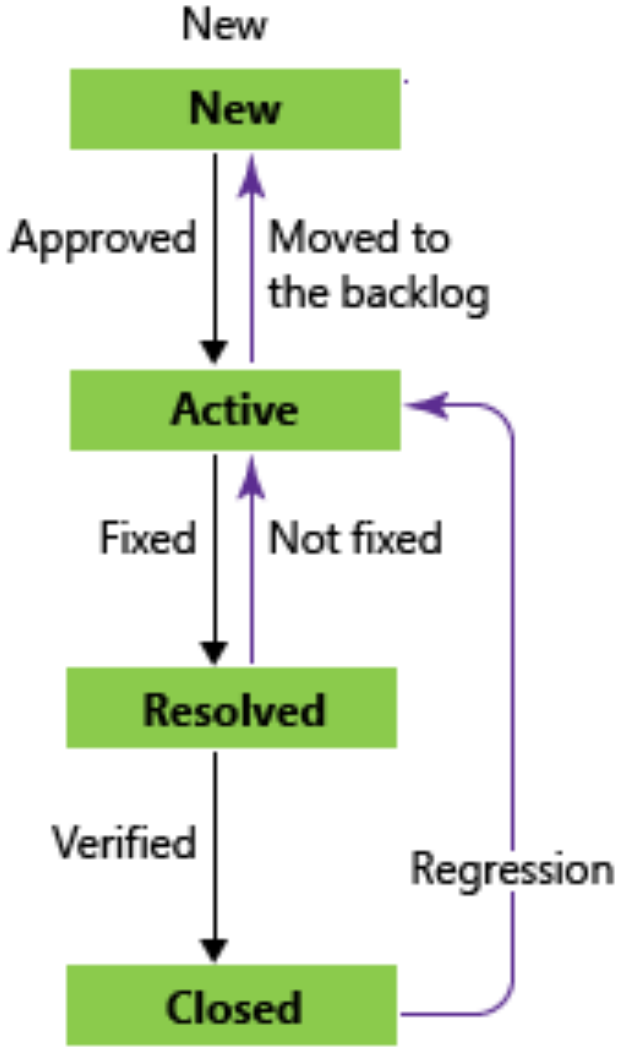
- You can access preview features that are specific to the Azure Portal from the https://preview.portal.azure.com page.
- Typical portal preview features provide performance, navigation, and accessibility improvements to the Azure portal interface.

Providing Feedback

- Typical portal preview features provide performance, navigation, and accessibility improvements to the Azure portal interface
- Feedback on the portal preview features can be submitted by sending a smile in the portal or by posting ideas and suggestions on the Azure Portal Feedback Forum

General Availability

- Once a feature is evaluated and tested successfully, it might be released to customers as part of Azure's default product, service, or feature set
- Bugs for features and products go through their lifecycle as in the graphic across.
- Once the feature meets a specific criteria the feature is released to all Azure customers, and this release is referred to *general availability.*



Monitoring feature updates

- Information about the latest updates to Azure products, services, and features, and product roadmaps, and announcements are available at Azure updates
- Azure updates page:
  - View details about all Azure updates
  - See which updates are in general availability, preview, or development
  - Subscribe to Azure update notifications by RSS

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