Microsoft

Microsoft Azure Fundamentals

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Agenda

Time	December 12th
9:0 – 9:15	Azure Fundamentals - Introduction
9:15	Azure Fundamentals – Module 1 Understanding cloud concepts
10:15	
10:15	Break – 30 minutes
10:45	Azure Fundamentals – Module 2 Understanding core Azure services
11:30	
11:30	Lunch – 60 minutes
12:30	
12:30	Azure Fundamentals – Module 3 Understand security, privacy, compliance, and trust
1:30	
1:30 -2:00	Break – 30 minutes
2:00	Azure Fundamentals – Module 4 Understand Azure pricing and support
3:30	
3:30	Wrap up / Feedback
4:00	

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.

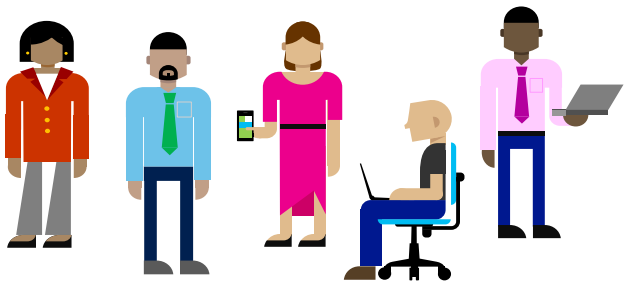
This course covers:

- 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

Audience

Azure Fundamentals is suitable for candidates from technical and non-technical backgrounds, whose current or future work relates to cloud computing.

For example, those who are involved in selling or purchasing cloud-based products, solutions and services, or those taking their first look at cloud computing and Azure



Prerequisites

There are no prerequisites for taking this course. Technical IT experience is not required; however, some general IT knowledge or experience is beneficial.

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

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Module 01: Cloud concepts

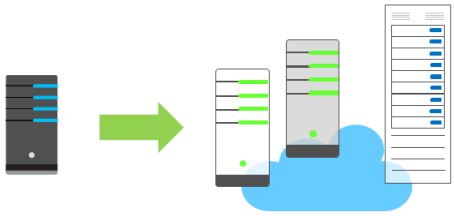
Key concepts and terms

- 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.



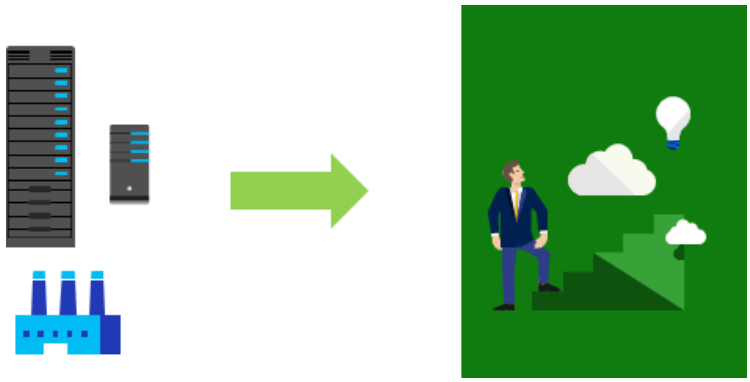
- Cloud providers such as Microsoft, Google, and Amazon Web Services (AWS) are very large businesses, and thus can leverage the benefits of economies of scale and then pass those benefits on to their customers.

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.

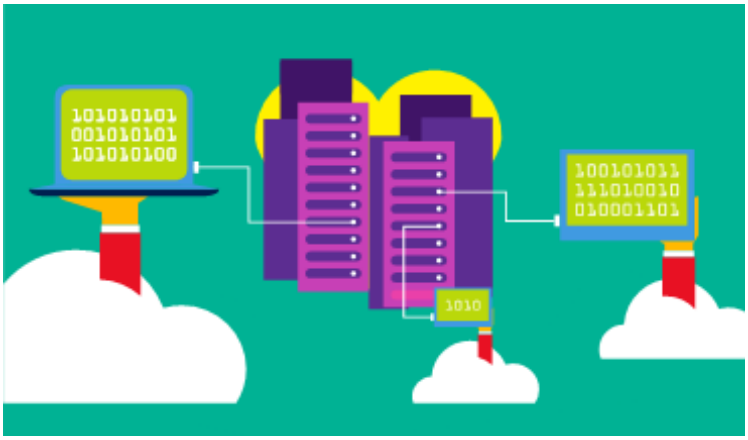
Consumption-based model



Users only pay for the resources they use

Types of cloud models

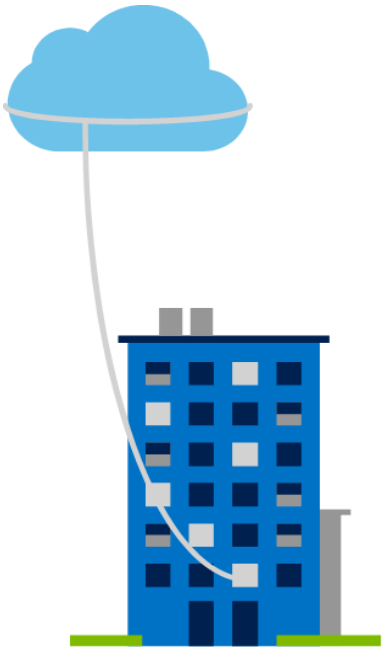
Public cloud



- 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.

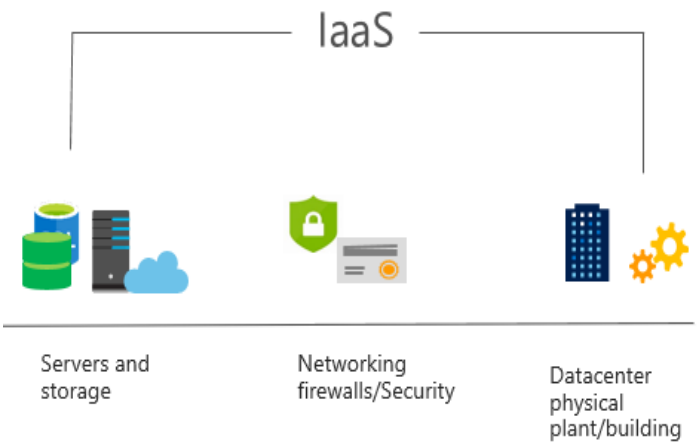
Hybrid cloud:

- 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.

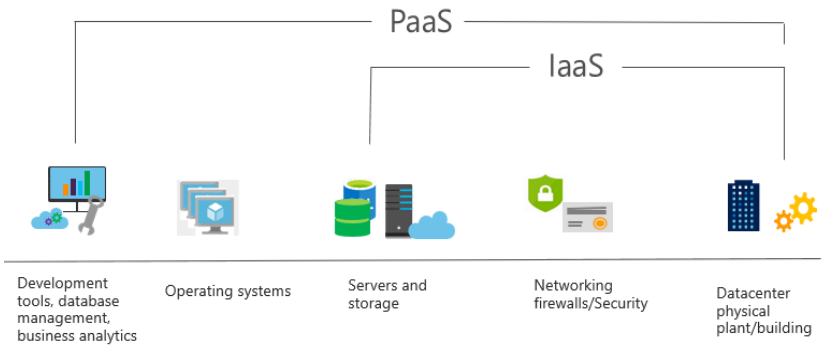
Types of cloud services

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.

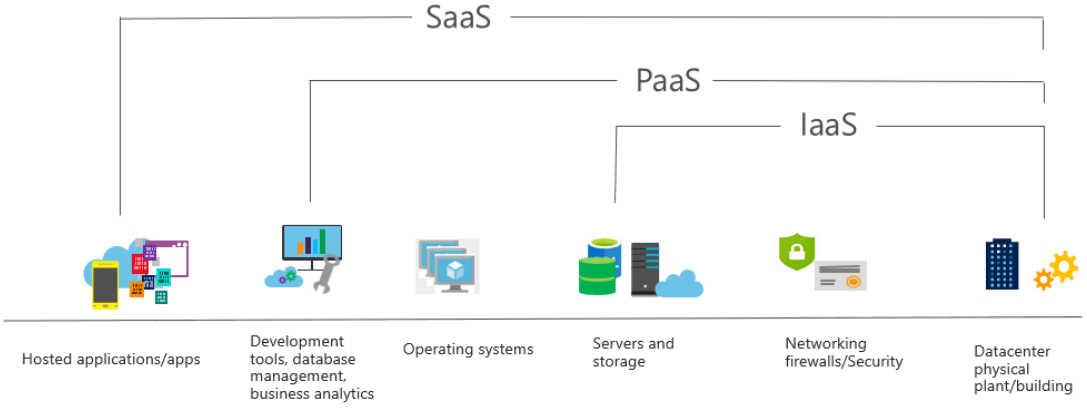


Platform as a Service (PaaS)



- 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.

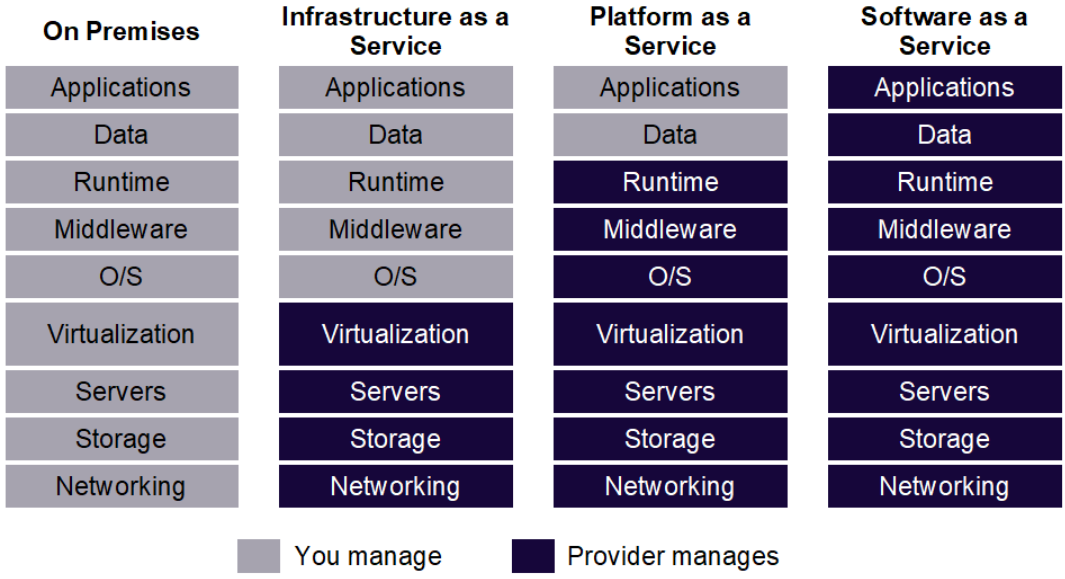
Cloud service comparison

- 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



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Module 02: Core Azure services

Core Azure architectural components

Regions

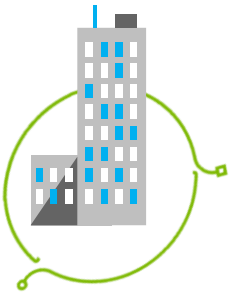
- Azure is made up of datacenters located around the globe. These datacenters are organized and made available to end users by country/region
- In reference to datacenters, a *region* is a geographical area on the planet containing at least one—but potentially multiple — datacenters that are in close 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

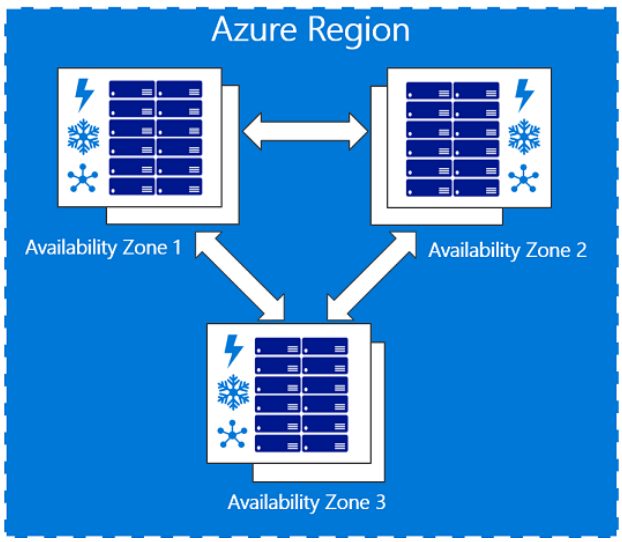
Discrete markets that preserve data residency and compliance boundaries.

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.

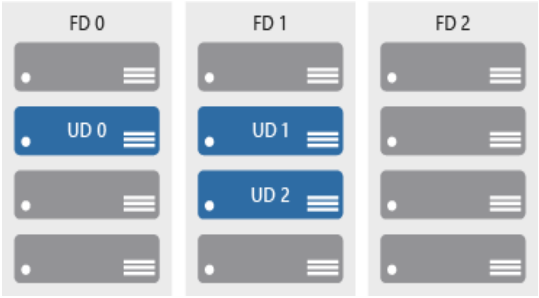


Availability sets

Keep applications online during maintenance or hardware failure.

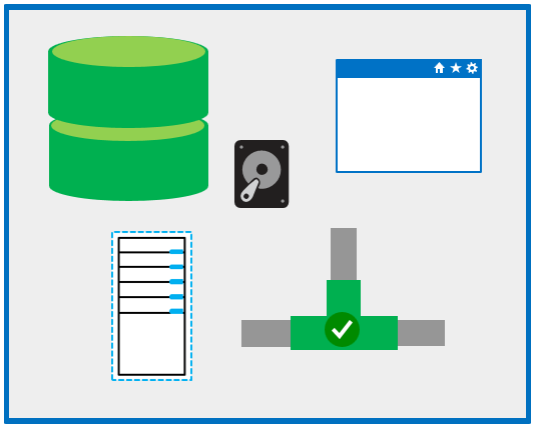
Comprised of:

- 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:

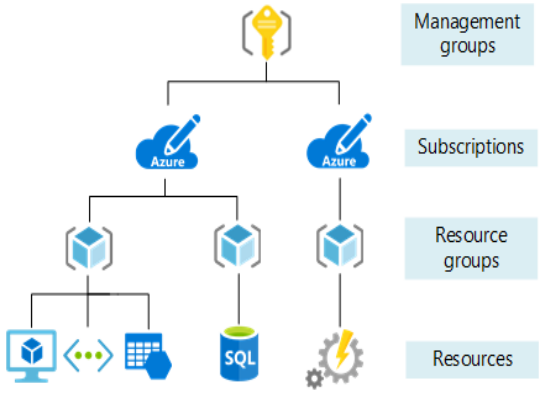
- Act as containers to aggregate the resources required by an application into a single, manageable unit.
- Every Azure resource must exist in one (and only one) Resource Group.

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



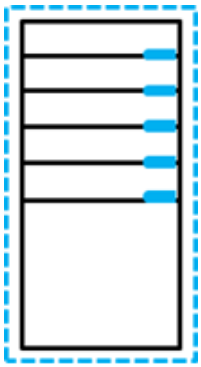
Core Azure services and products

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

Demo: Create an Azure virtual machine

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

Demo: Deploy Azure Container Instances (ACI) in Azure Portal.

Azure network services

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

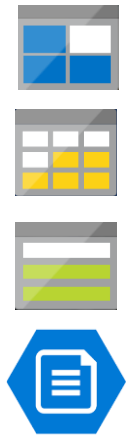
- **Azure Virtual Network**: An IaaS service to create and use VMs in the cloud
- **Azure Load Balancer**: Designed for automatic scaling of identical VMs
- **VPN Gateway**: A PaaS offering to build, deploy, and scale enterprise-grade web, mobile, and API apps
- **Azure Application Gateway**: Creates infrastructure based on an event
- **Content Delivery Network**: Creates infrastructure based on an event

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.

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

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

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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.

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Module 03: Security, privacy, compliance, and trust

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

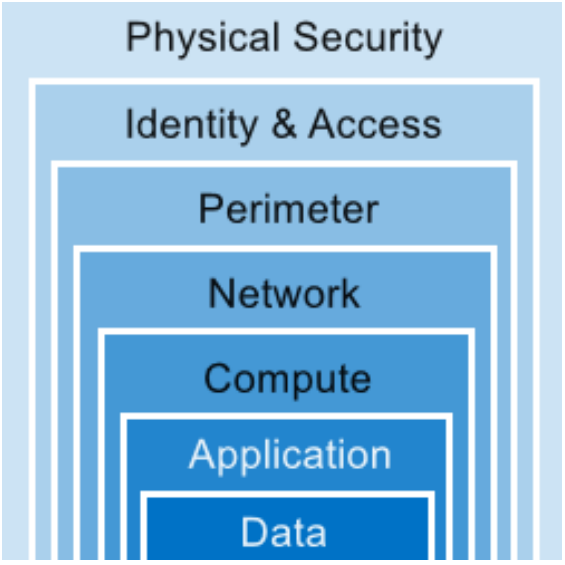
Application security group features :

- 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.



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 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 Monitor

Collect, analyze, 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.

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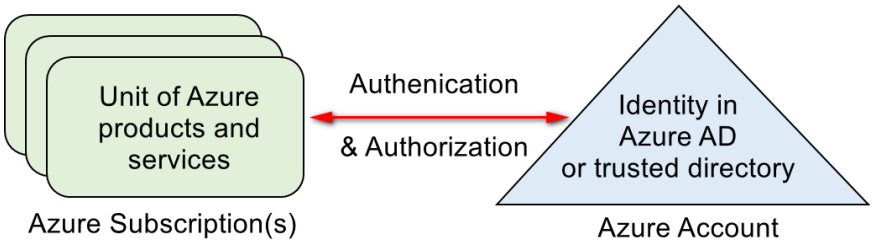
Module 04: Azure pricing and support

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 account.



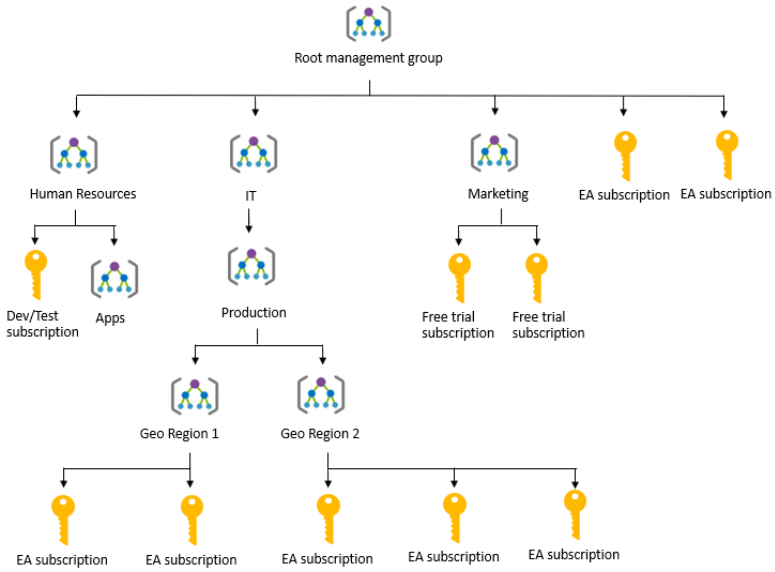
- Azure offers free and paid subscription options to suit different needs and requirements. An account can have one subscription or multiple subscriptions that have different billing models, and to which you apply different access-management policies.

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.

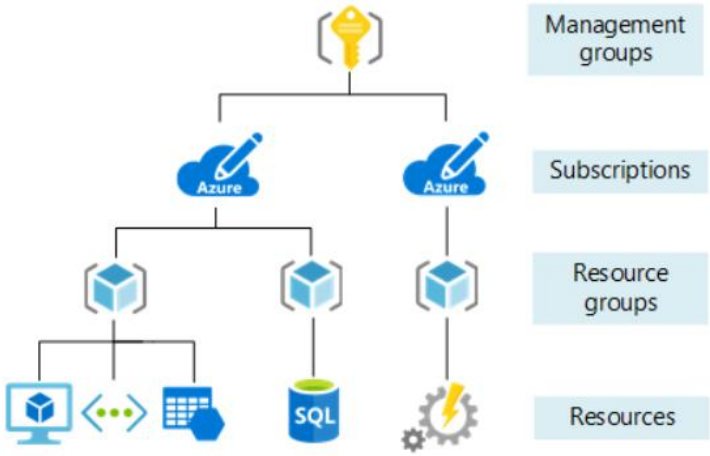
Management groups

- *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:



Planning and managing costs

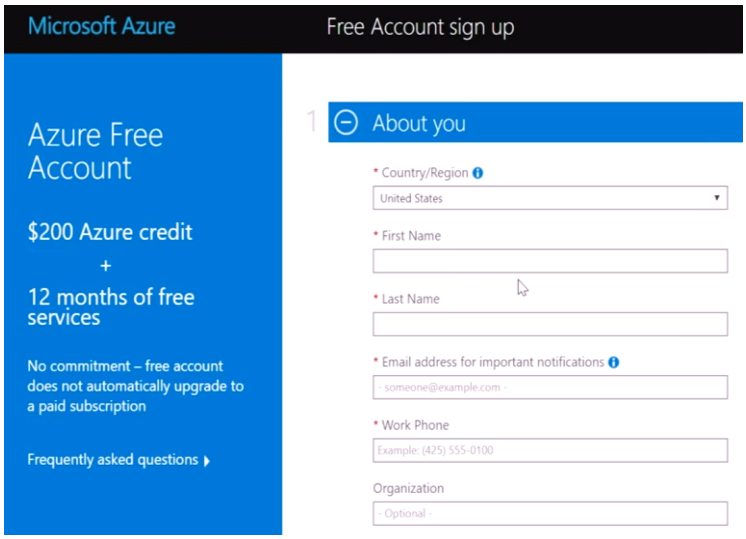
Purchasing Azure products and services

- 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

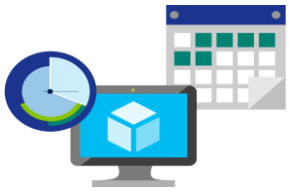
- An *Azure free account* provides subscribers with a $200 USD Azure credit that they can use for paid Azure products during a 30-day trial period.
- Once you use that $200 USD credit or reach your trial's end, Azure suspends your account unless you sign up for a paid account.



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.

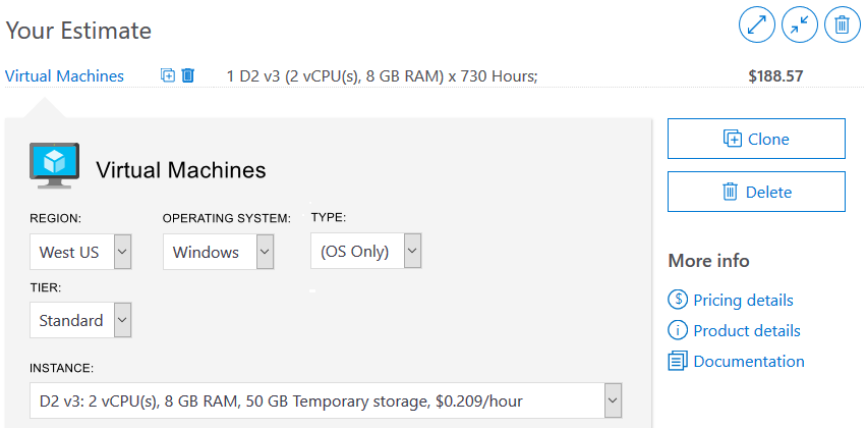


Zones for Billing Purposes

- *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.

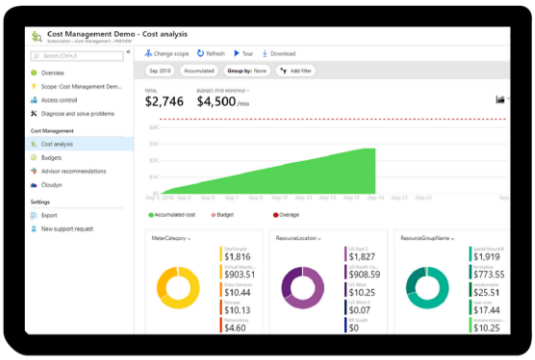
Pricing calculator

- 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



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

Alternative support channels

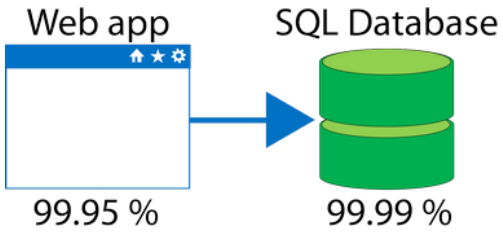
- Other support channels available outside of the Azure official support plans:
  - Microsoft Developer Network (MSDN) Azure Forums.
  - Stack Overflow
  - Server Fault
  - Azure Feedback Forums at Microsoft Azure general feedback
  - Twitter. Tweet @AzureSupport to get answers and support

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

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

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