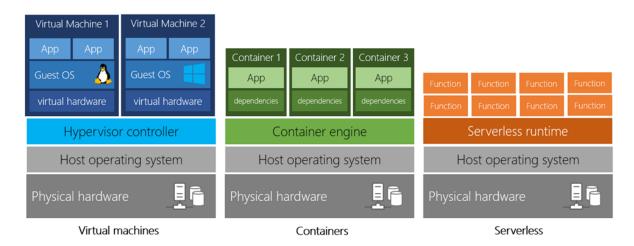**Components:**
Compute
Storage
Networking
Analytics

Compute:
VM
Containers
Azure App Service
Serverless Computing

Containers provide a consistent, isolated execution environment for applications. They're similar to VMs except they don't require a guest operating system.

Serverless computing lets you run application code without creating, configuring, or maintaining a server. The core idea is that your application is broken into separate functions that run when triggered by some action.

Cloud computing is flexible, scalable, cost-efficient, elastic, reliable, global, secure.

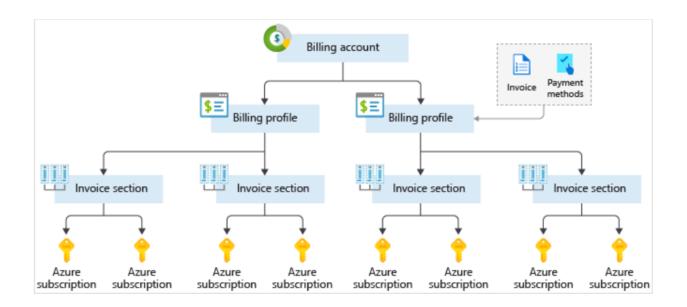Scale up/Vertical and Scale Out/Horizontal.

Elastic: Automatic Scale up/Scale out

Cloud computing providers offer data backup, disaster recovery, and data replication services to make sure your data is always safe. Fault tolerant.

Security CSA Start compliance = ISO/IEC 27001.

GDPR applies to organizations that offer goods and services to people in the European Union (EU), or that collect and analyze data tied to EU residents. The GDPR applies no matter where you are located.

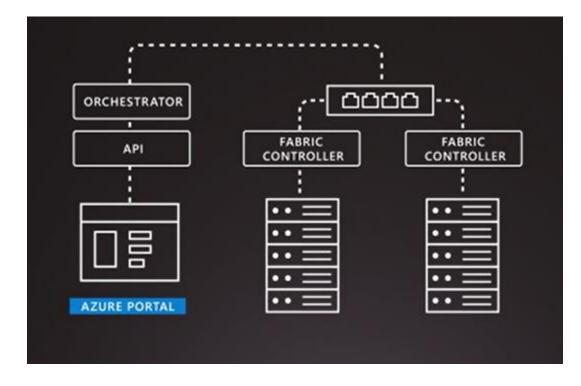| On-premises	Infrastructure as a Service	Platform as a Service	Software as a Service
Applications	Applications	Applications	Applications
Data	Data	Data	Data
Runtime	Runtime	Runtime	Runtime
Middleware	Middleware	Middleware	Middleware
OS	OS	OS	OS
Virtualization	Virtualization	Virtualization	Virtualization
Servers	Servers	Servers	Servers
Storage	Storage	Storage	Storage
Networking	Networking	Networking	Networking

You Manage   Provider Manages

Free across all support plans:

- Billing and Subcription Support
- Azure Quickstart Center
- Azure Service Health
- Azure Advisor

Cloud computing is the delivery of computing services over the Internet using a pay-as-you-go pricing model.

	Developer	Standard	Professional Direct
Best for	Non-critical workloads	Production workloads	Business-critical workloads
Reactive technical support	1 business day response	1-hour response for critical cases	1-hour response + priority tracking of critical cases
Proactive technical support	Not applicable	Not applicable	Access to a pool of technical experts

Platform Services

Security & Management
- Security Center
- Azure portal
- Azure Active Directory
- Azure AD B2C
- Multi-Factor Authentication
- Automation
- Key Vault
- Azure Marketplace
- VM Image Gallery
- REST API and CLI

Media & CDN
- Media Services
- Media Analytics
- Content Delivery Network

Integration
- API Management
- Service Bus
- Azure Logic Apps

Compute Services
- Container Service
- VM Scale Sets
- Azure Batch
- Dev/Test Lab

Application Platform
- Web Apps
- Mobile Apps
- API Apps
- Cloud Services
- Service Fabric
- Notification Hubs
- Functions

Developer Services
- Visual Studio
- Mobile Engagement
- Azure DevOps
- Xamarin
- Application Insights
- Visual Studio App Center

Data
- SQL Database
- SQL Data Warehouse
- Cosmos DB
- SQL Server Stretch Database
- Azure Cache for Redis
- Table Storage
- Azure Search

Intelligence
- Cognitive Services
- Bot Services
- Azure ML Studio

Analytics & IoT
- HDInsight
- Machine Learning
- Stream Analytics
- Data Catalog
- Data Lake Analytics Service
- Data Lake Storage
- IoT Hub
- Event Hubs
- Data Factory
- Power BI Embedded

Hybrid Cloud
- Azure AD Connect Health
- AD Privileged Identity Management
- Domain Services
- Backup
- Azure Monitor
- Import/Export
- Azure Site Recovery
- StorSimple

Infrastructure Services

Compute
- Virtual Machines
- Containers and Azure Kubernetes

Storage
- Blob
- Queues
- Files
- Disks

Networking
- Virtual Network
- Load Balancer
- DNS
- Express Route
- Traffic Manager
- VPN Gateway
- App Gateway

Datacenter Infrastructure

Deployment: World → Geographies → Region Pairs → Regions → Availability Zones

A region is a geographical area on the planet containing at least one, but potentially multiple datacenters that are nearby and networked together with a low-latency network. An Azure geography is a discrete market typically containing two or more regions that preserve data residency and compliance boundaries. Availability Zones are physically separate datacenters (3 or more) within an Azure region. Region Pair: Each Azure region is always paired with another region within the same geography (such as US, Europe, or Asia) at least 300 miles away.

Azure AD, Azure Traffic manager and Azure DNS do not require region, they are global. Availability zones are created using one or more datacenters, and there is a minimum of three zones within a single region.

Resiliency is the ability of a system to recover from failures and continue to function. Availability refers to the time that a system is functional and working.

Azure resources can be managed and monitored using: Azure Portal, Azure PowerShell or Azure CLI, Azure Cloud Shell, Azure Mobile App. Azure Portal does not provide any feature to automate repetitive tasks. Powershell Core can run on Win, Mac and Linux.

Azure Advisor is a free service built into Azure that provides recommendations on high availability, security, performance, operational excellence, and cost. Advisor analyzes your deployed services and looks for ways to improve your environment across those areas.

Compute in Azure: Virtual machines, Containers, Azure App Service, Serverless computing

App services in Azure: Web Apps, API Apps, WebJobs, Mobile Apps

FMA – Failure Mode Analysis

An availability set is a logical grouping of two or more VMs that help keep your application available during planned or unplanned maintenance. Update domains indicate groups of VMs and underlying physical hardware that can be rebooted at the same time. VMs that are part of an availability set automatically switch to a working physical server so the VM continues to run. The group of virtual machines that share common hardware are in the same fault domain. A fault domain is essentially a rack of servers. There's no cost for an availability set. You only pay for the VMs within the availability set.

Availability Set → up to 3 physical fault domains + 5 logical update Domains

Azure Virtual Machine Scale Sets let you create and manage a group of identical, load balanced VMs.
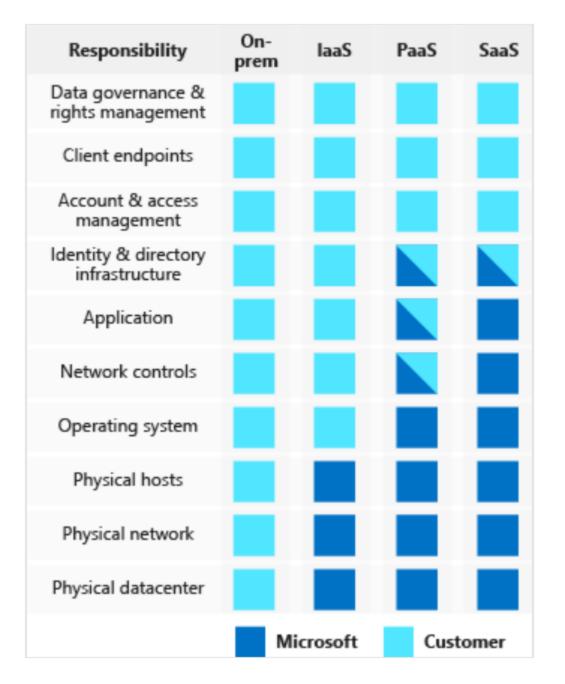
Types of App services: Web Apps, API Apps, WebJobs, Mobile Apps

Serverless: Azure Functions, Azure Logic Apps

Azure also has the capability of storing up to 32 TB of data in its virtual disks. Blob storage can hold up to 8TB of data. Disk Storage is like a disk attached to a VM, it can be access only by that machine. Use premium SSD disks for mission-critical production applications.

Blob Storage Tier: Hot, cool (30), archive (180).

Azure data storage provides data backup, load balancing, disaster recovery, and data replication as services to ensure data safety and high availability.

Responsibility	On-prem	IaaS	PaaS	SaaS
Data governance & rights management	Customer	Customer	Customer	Customer
Client endpoints	Customer	Customer	Customer	Customer
Account & access management	Customer	Customer	Customer	Customer
Identity & directory infrastructure	Customer	Customer	Shared	Shared
Application	Customer	Customer	Shared	Microsoft
Network controls	Customer	Customer	Shared	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

Legend: Microsoft | Customer

Azure Security Center is a monitoring service that provides threat protection across all of your services both in Azure, and on-premises. Free tier is assessment and recommendation only without real-time monitoring and protection. Standard is full offering.

Azure AD is used for both Authentication and Authorization. A specific organization's Azure Active Directory instance is known as an "Active Directory Tenant"

RBAC scope:

An Azure account is an identity in either Azure Active Directory (Azure AD), or a directory that is trusted by Azure AD, such as a work or school organization.

Azure Firewall – For non-HTTP/S traffic.
Azure Application Gateway (includes Web Application Firewall) for HTTP/S traffic

Network Security Groups allow you to filter network traffic to and from Azure resources in an Azure virtual network.

Azure Advanced Threat Protection (Azure ATP) is a cloud-based security solution that identifies, detects, and helps you investigate advanced threats, compromised identities, and malicious insider actions directed at your organization.

Unlike RBAC, Azure Policy is a default-allow-and-explicit-deny system. Once defined, a policy can be applied to any scope that Azure supports, from management groups to individual resource. Policy can be applied to a larger scope with few exceptions at lower scope.

Azure Management Groups are containers for managing access, policies, and compliance across multiple Azure subscriptions. All subscriptions within a management group automatically inherit the conditions applied to the management group. Policy applied at management group level cannot be altered by subscription owners in that management group.

Azure Blueprints enables cloud architects and central information technology groups to define a repeatable set of Azure resources that implements and adheres to an organization's standards, patterns,

and requirements. Azure Blueprints is a declarative way to define: Role assignments, Policy assignments, Resource manager templates, Resource Groups.

Azure Monitor maximizes the availability and performance of your applications by delivering a comprehensive solution for collecting, analyzing, and **acting on telemetry** from your cloud and on-premises environments. Can Alert and AutoScale.

Azure Service Health is a dashboard.

Azure Resource Groups are logical containers for Azure resources. Each resource must be assigned to one and only one group. Groups cannot be nested. When group is deleted, everything in it is deleted. Resource groups are a scope for applying RBAC.

A resource can have up to 50 tags. Tags are not inherited. Not all resources support tags. Old style classic resources cannot be tagged.

Resource locks are a setting that can be applied to any resource to block modification or deletion. Locks are Delete or Read-Only. Locks are inherited. Locks can be applied at any level from subscription down to individual resource.

De-Allocating a VM is like shutting down the VM. Storage charges still apply unless Deleted.

Azure Monitor gives advice across many areas including Cost. Azure Cost Management is an analytical tool that gives deep insight in to current and historical costs. Azure TCO is used to **predict** costs. It gives cost comparison between on-prem and could charges based on scenarios.

An Azure subscription is a logical container used to provision resources in Microsoft Azure.

Azure credits: $50 for VS Professional and $150 for VS Enterprise. This azure credit is for dev and test only and resources cannot run continuously for more than 120 hours.

Reserved Instances can be cheaper if workloads are static and predictable.

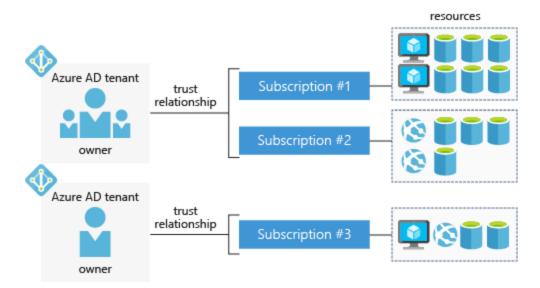PaaS and SaaS are typically less expensive than IaaS.

Azure Hybrid allows customer to resuse pre-existing licenses. Standard Edition license can be used either on-prem or in azure but not both. Datacenter Edition licenses can be used in both places. Customer with EA can use unused licenses on VMs using BYOL images.

The most commonly used subscriptions are:
•Free
•Pay-As-You-Go
•Enterprise Agreement
•Student

An Azure account can have multiple subscriptions. Billing and Access Control occur by Subscription.

Here's a simple representation of how account owners, subscriptions, tenants, and resources work together.

Azure Dashboard parts:

1. Dashboard controls
2. All resources tile
3. Quickstarts + tutorials tile
4. Service Health tile
5. Marketplace tile

Scaling VMS:

1. Availability Sets
2. VM Scale Sets
3. Azure Batch

Kubernetes is a container orchestration system to automate application deployment, management and scaling.

Microservice Architecture: Divide an application in to loosely coupled independent parts that can be deployed, maintained and scaled separately. Preferably with each part managing its state independently.

Azure Virtual Networks are scoped to a single region. A VPN gateway is used to connect Azure Virtual Networks to on-premise networks.

To provide a dedicated, private connection between your network and Azure, you can use Azure ExpressRoute.