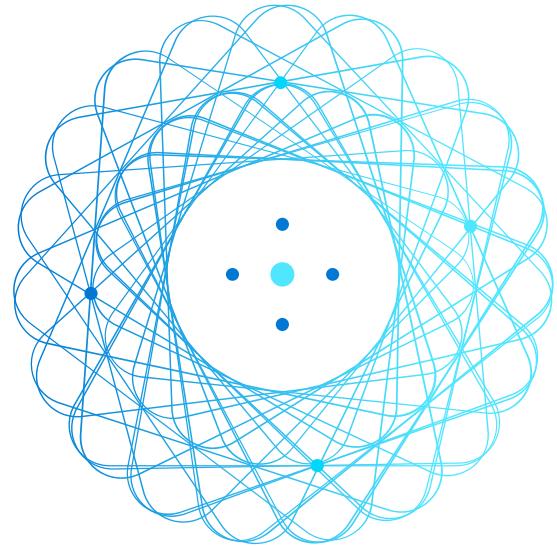




# Microsoft Azure Fundamentals [AZ-900]



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## Course Agenda

Learning Path 01 – Cloud concepts

Learning Path 02 – Azure architecture and services

Learning Path 03 – Azure management and governance

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## Certification areas (AZ-900)

Study areas	Weight
Describe Cloud Concepts	25-30%
Describe Azure architecture and services	35-40%
Describe Azure management and governance	30-35%

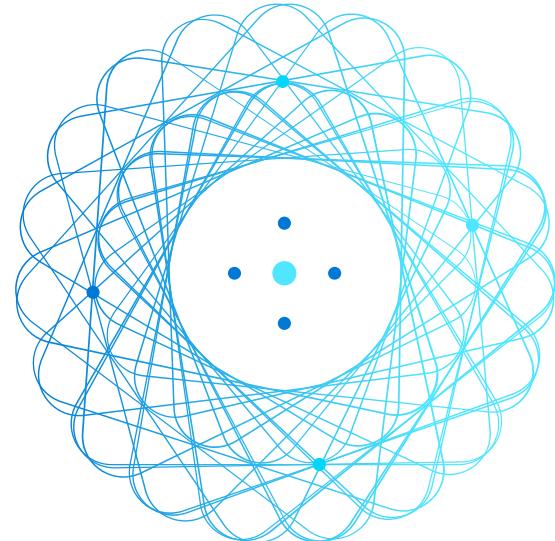
- This course maps directly to the exam AZ-900 Microsoft Azure Fundamentals.
- Percentages indicate the relative weight of each area on the exam.
- The higher the percentage, the more questions you are likely to see in that area.

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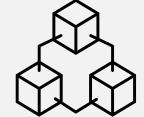
## Learning Path 01 : Cloud Concepts



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# Cloud Computing

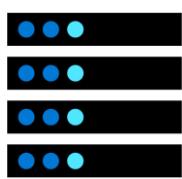


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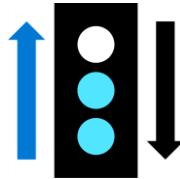
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## What is cloud computing?

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



Compute



Networking

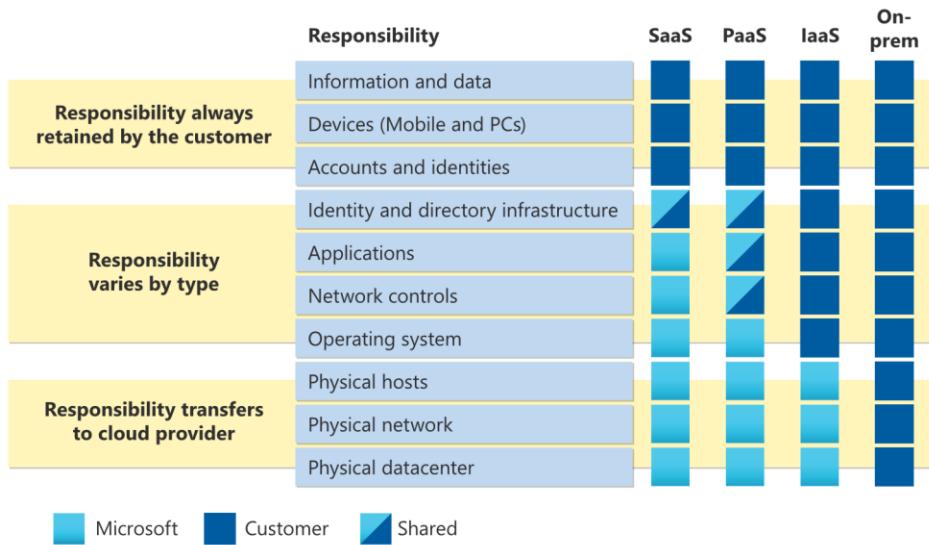


Storage

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## Shared responsibility model

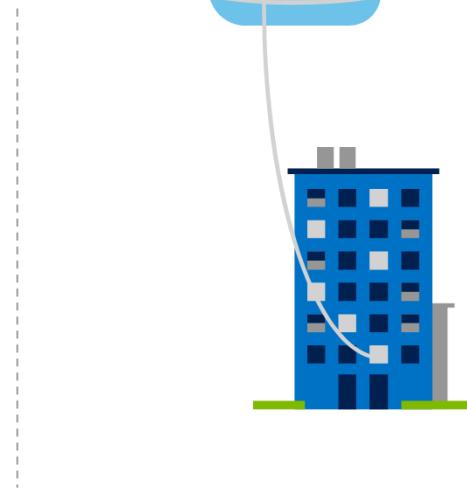


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## Private cloud

- Organizations create a cloud environment in their datacenter.
- Organization is responsible for operating the services they provide.
- Does not provide access to users outside of the organization.



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## 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).



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## Hybrid cloud



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

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## Cloud model comparison

Public Cloud	<ul style="list-style-type: none"> <li>No capital expenditures to scale up.</li> <li>Applications can be quickly provisioned and deprovisioned.</li> <li>Organizations pay only for what they use.</li> </ul>
Private Cloud	<ul style="list-style-type: none"> <li>Hardware must be purchased for start-up and maintenance.</li> <li>Organizations have complete control over resources and security.</li> <li>Organizations are responsible for hardware maintenance and updates.</li> </ul>
Hybrid Cloud	<ul style="list-style-type: none"> <li>Provides the most flexibility.</li> <li>Organizations determine where to run their applications.</li> <li>Organizations control security, compliance, or legal requirements.</li> </ul>

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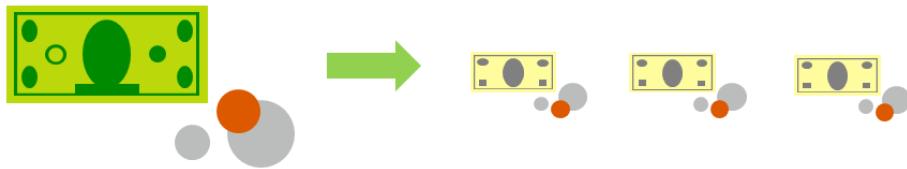
## Compare CapEx vs. OpEx

### Capital Expenditure (CapEx)

- The up-front spending of money on physical infrastructure.
- Costs from CapEx have a value that reduces over time.

### Operational Expenditure (OpEx)

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



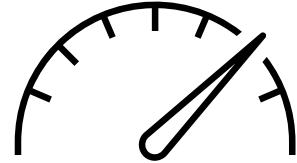
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## Consumption-based model

Cloud service providers operate on a consumption-based model, which means that end users only pay for the resources that they use. Whatever they use is what they pay for.

- Better cost prediction
- Prices for individual resources and services are provided
- Billing is based on actual usage



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## Cloud benefits



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## Cloud Benefits

High availability	Elasticity
Scalability	Reliability
Predictability	Security
Governance	Manageability

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## Cloud service types

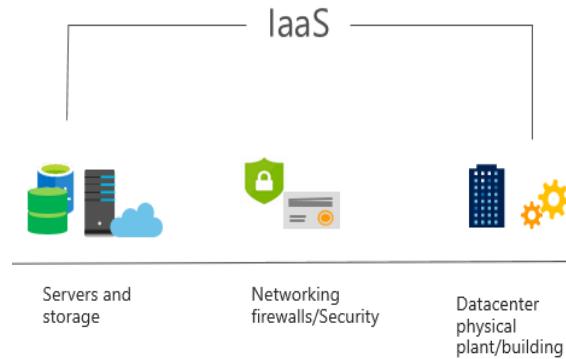


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## Infrastructure as a Service (IaaS)

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

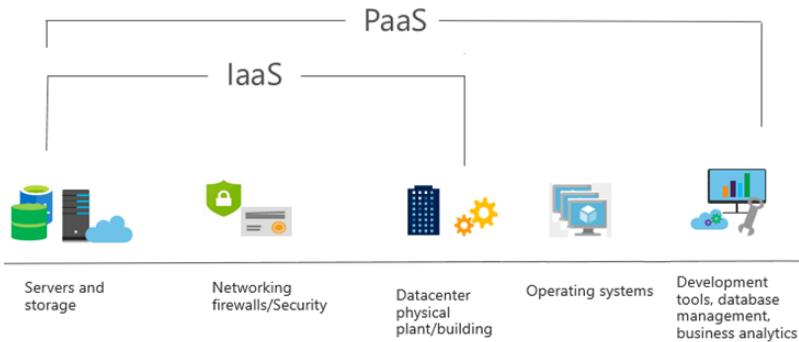


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## Platform as a Service (PaaS)

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

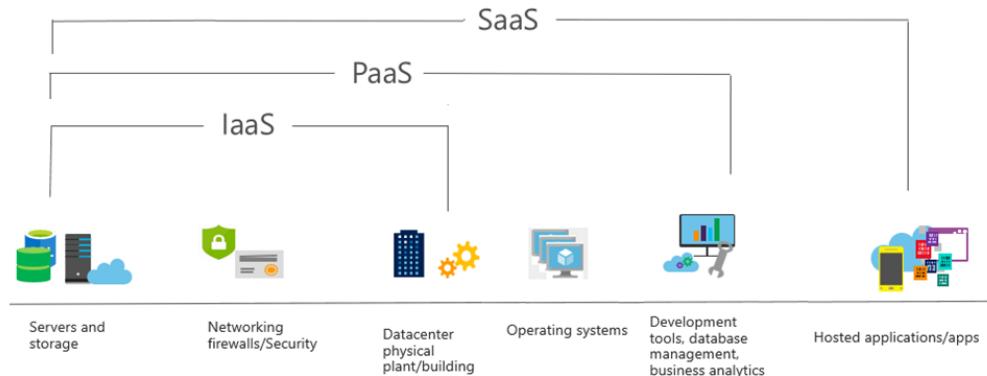


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## Software as a Service (SaaS)

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



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## Cloud service comparison

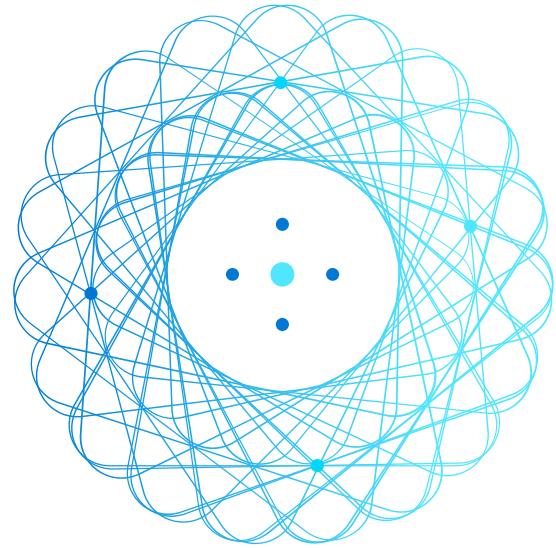
IaaS	PaaS	SaaS
The most flexible cloud service.  You configure and manage the hardware for your application.	Focus on application development.  Platform management is handled by the cloud provider.	Pay-as-you-go pricing model.  Users pay for the software they use on a subscription model.

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## Learning Path 02 : Azure Architecture and Services



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## Azure architectural components



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# Regions

Azure offers more global regions than any other cloud provider with 60+ regions representing over 140 countries



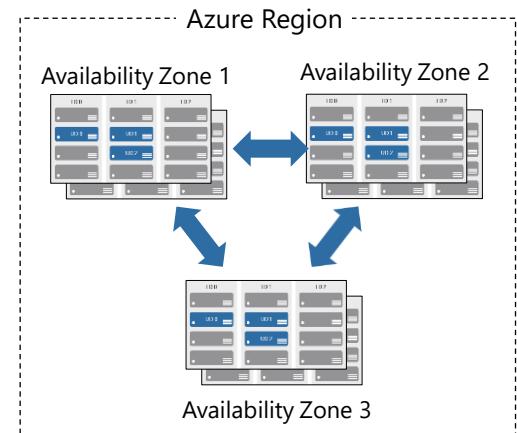
- Regions are made up of one or more datacenters in close proximity.
- Provide flexibility and scale to reduce customer latency.
- Preserve data residency with a comprehensive compliance offering.

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# Availability zones

- Provide protection against downtime due to datacenter failure.
- Physically separate datacenters within the same region.
- Each datacenter is equipped with independent power, cooling, and networking.
- Connected through private fiber-optic networks.



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## Region Pairs

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

Web Link: <https://aka.ms/PairedRegions>

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

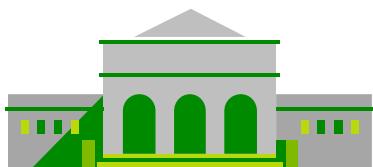


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## Azure Sovereign Regions (US Government services)

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



### Azure Government:

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

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## Azure Sovereign Regions (Azure China)

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

```
10101
01010
00100
```

Azure China features:

```
10101
01010
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```

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

```
10101
01010
00100
```

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## Azure Resources

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



Virtual Machines



Storage Accounts



Virtual Networks



App Services



SQL Databases



Functions

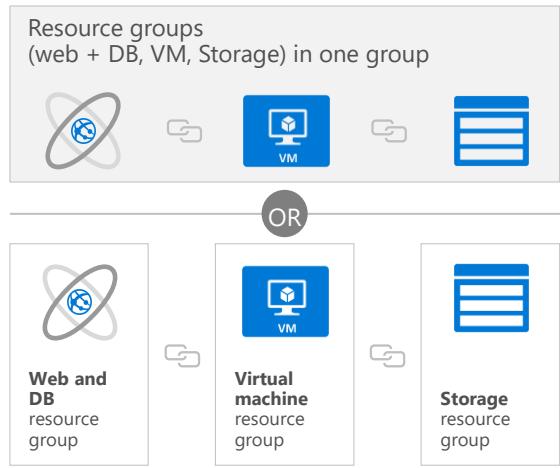
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## Resource groups

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

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



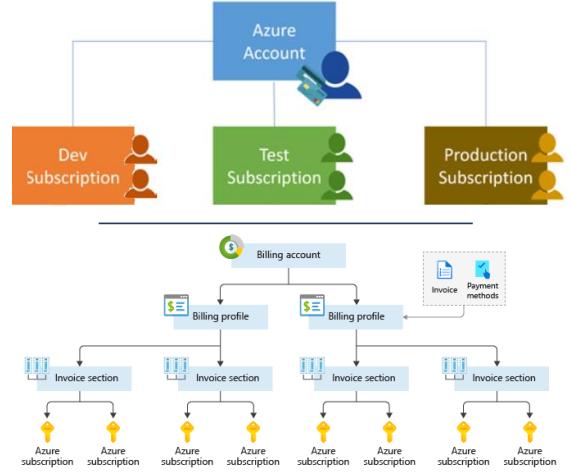
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## Azure Subscriptions

An Azure subscription provides you with authenticated and authorized access to Azure accounts.

- **Billing boundary:** generate separate billing reports and invoices for each subscription.
- **Access control boundary:** manage and control access to the resources that users can provision with specific subscriptions.

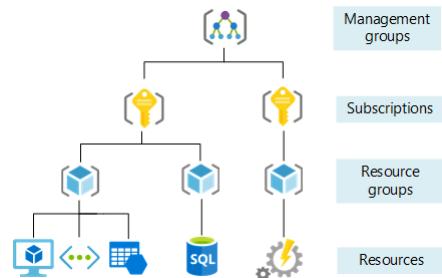


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## Management Groups

- Management groups can include multiple Azure subscriptions.
- Subscriptions inherit conditions applied to the management group.
- 10,000 management groups can be supported in a single directory.
- A management group tree can support up to six levels of depth.



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## Compute and Networking



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## Azure compute services

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



Virtual  
Machines



App  
Services



Container  
Instances



Azure Kubernetes  
Services (AKS)



Azure Virtual  
Desktop

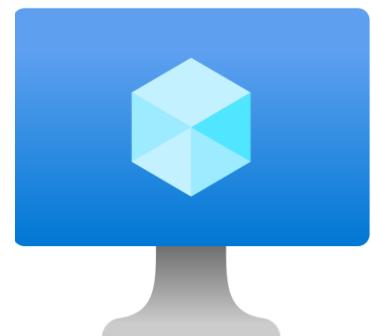
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## Azure virtual machines

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

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



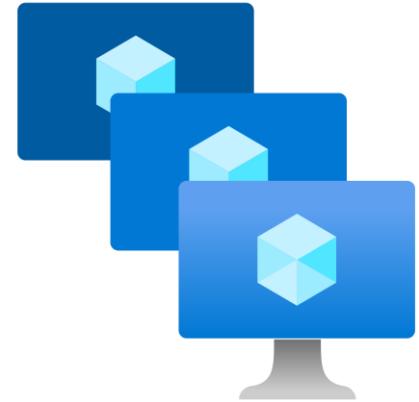
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## VM scale sets

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

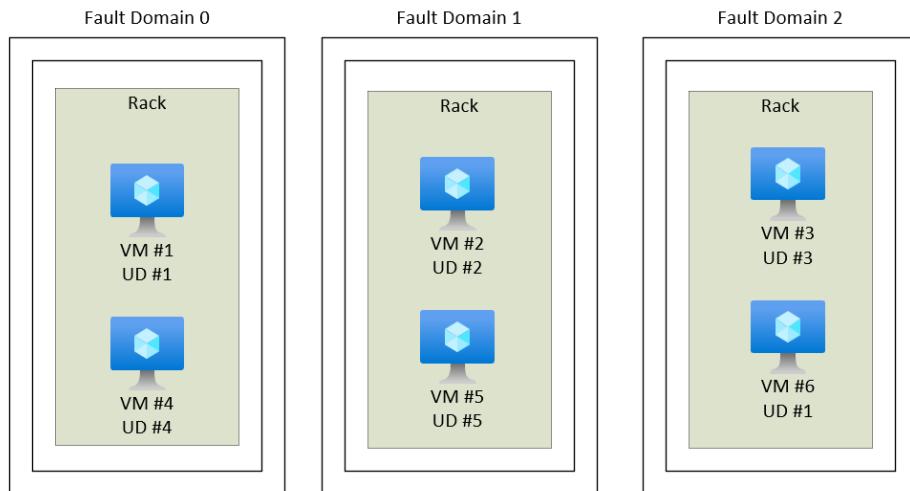
- Scale out when resource needs increase.
- Scale in when resource needs are lower.



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## VM availability sets



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## Azure Virtual Desktop

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

- Create a full desktop virtualization environment without having to run additional gateway servers.
- Reduce risk of resource being left behind.
- True multi-session deployments.



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## Azure Container Services

Azure **Containers** are a light-weight, virtualized environment that does not require operating system management, and can respond to changes on demand.



**Azure Container Instances:** a PaaS offering that runs a container in Azure without the need to manage a virtual machine or additional services.



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

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# Azure Functions

## Azure Functions



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

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# Comparing Azure compute options

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

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## Azure App Services



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

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

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## Azure networking services



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

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

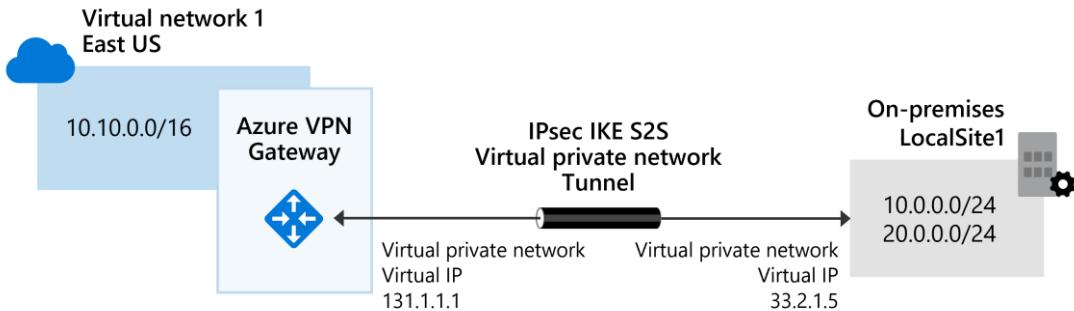
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## Azure networking services



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



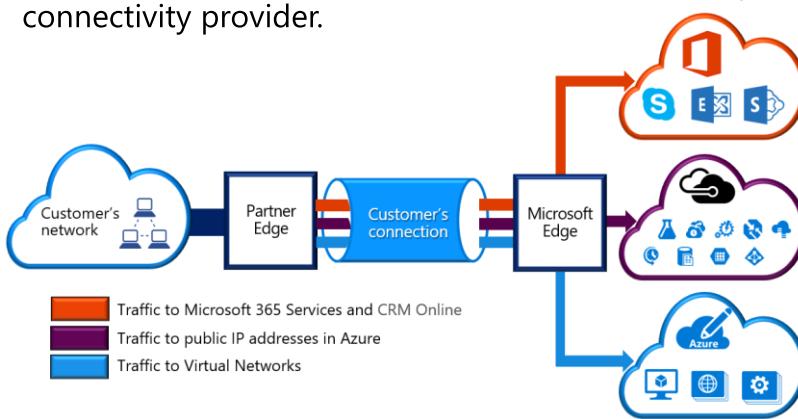
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## Azure networking services



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



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# Storage



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## Storage accounts

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



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## Storage redundancy

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

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## Azure storage services



**Container storage (blob)** is optimized for storing massive amounts of unstructured data, such as text or binary data.



**Disk storage** provides disks for virtual machines, applications, and other services to access and use.



**Azure Files** sets up a highly available network file shares that can be accessed by using the standard Server Message Block (SMB) protocol.

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## Storage service public endpoints

Storage service	Public endpoint
Blob Storage	<a href="https://&lt;storage-account-name&gt;.blob.core.windows.net">https://&lt;storage-account-name&gt;.blob.core.windows.net</a>
Data Lake Storage Gen2	<a href="https://&lt;storage-account-name&gt;.dfs.core.windows.net">https://&lt;storage-account-name&gt;.dfs.core.windows.net</a>
Azure Files	<a href="https://&lt;storage-account-name&gt;.file.core.windows.net">https://&lt;storage-account-name&gt;.file.core.windows.net</a>
Queue Storage	<a href="https://&lt;storage-account-name&gt;.queue.core.windows.net">https://&lt;storage-account-name&gt;.queue.core.windows.net</a>
Table Storage	<a href="https://&lt;storage-account-name&gt;.table.core.windows.net">https://&lt;storage-account-name&gt;.table.core.windows.net</a>

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## Azure storage access tiers

 Hot	 Cool	 Archive
Optimized for storing data that is accessed frequently.	Optimized for storing data that is infrequently accessed and stored for at least 30 days.	Optimized for storing data that is rarely accessed and stored for at least 180 days with flexible latency requirements.

You can switch between these access tiers at any time.

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## Azure Migrate

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



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## Azure Data Box

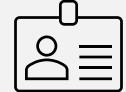
- Store up to 80 terabytes of data.
- Move your disaster recovery backups to Azure.
- Protect your data in a rugged case during transit.
- Migrate data out of Azure for compliance or regulatory needs.
- Migrate data to Azure from remote locations with limited or no connectivity.



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# Identity, Access, and Security



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## Azure Active Directory (AAD)

**Azure Active Directory (AAD)** is Microsoft Azure's cloud-based identity and access management service.

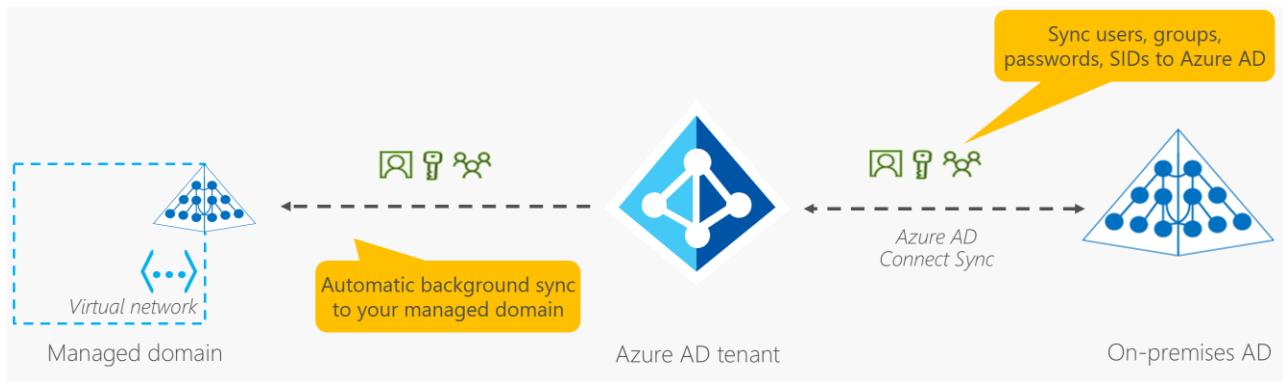
- Authentication (employees sign-in to access resources).
- Single sign-on (SSO).
- Application management.
- Business to Business (B2B).
- Business to Customer (B2C) identity services.
- Device management.



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



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

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## Compare Authentication and Authorization

### Authentication

- Identifies the person or service seeking access to a resource.
- Requests legitimate access credentials.
- Basis for creating secure identity and access control principles.

### Authorization

- Determines an authenticated person's or service's level of access.
- Defines which data they can access, and what they can do with it.



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## Azure Multi-Factor Authentication

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

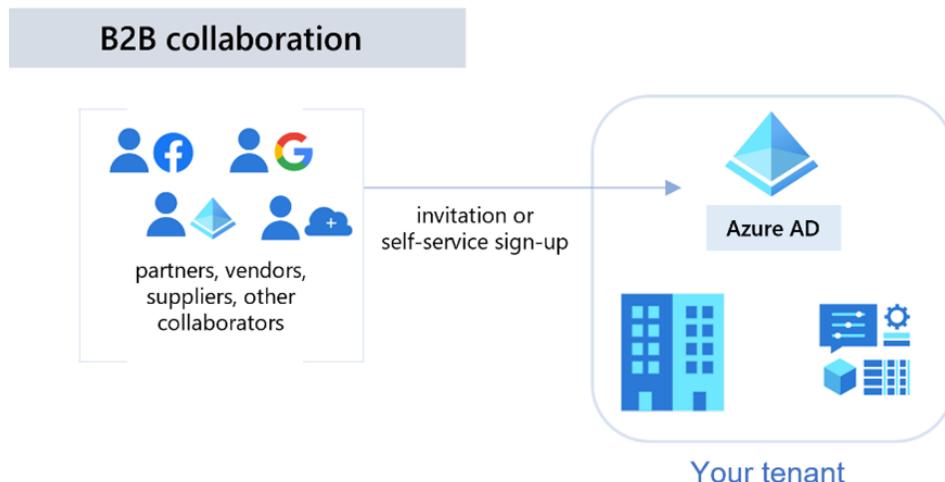
- Something you know ↔ Something you possess ↔ Something you are



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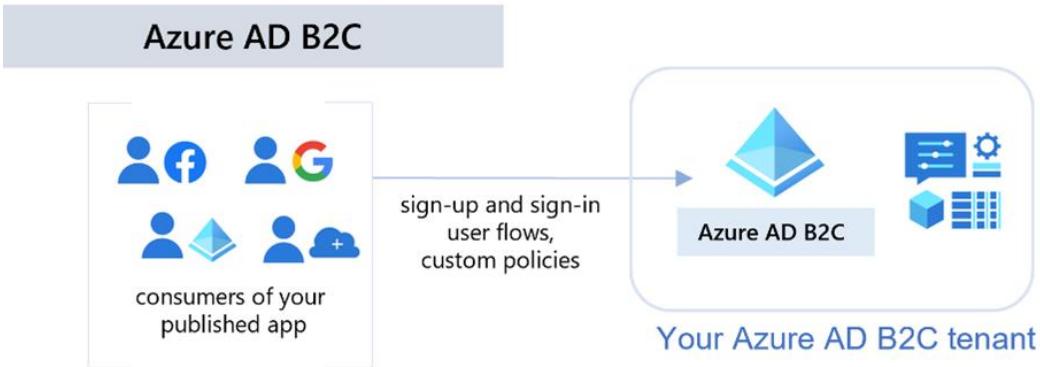
## External Identities B2B



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## External Identities B2C



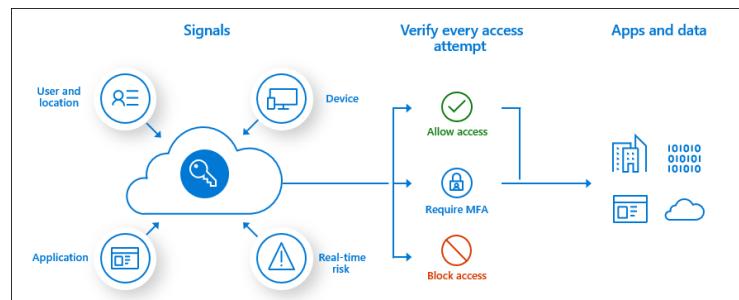
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## Conditional Access

**Conditional Access** is used by Azure Active Directory to bring signals together, to make decisions, and enforce organizational policies.

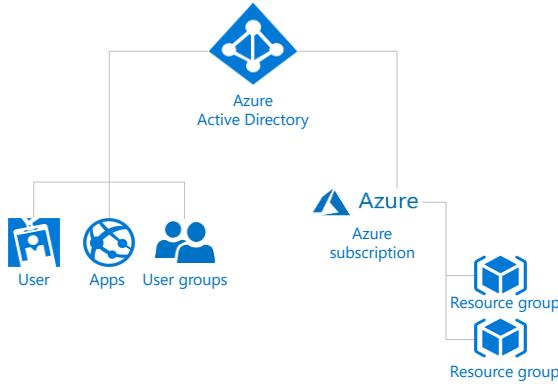
- User or Group Membership
- IP Location
- Device
- Application
- Risk Detection



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



- Fine-grained access management.
- Segregate duties within the team and grant only the amount of access to users that they need to perform their jobs.
- Enables access to the Azure portal and controlling access to resources.

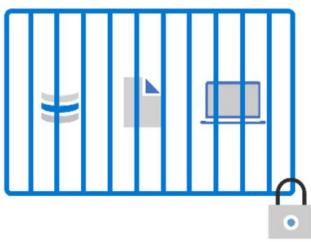
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## Zero Trust

### Secure assets where they are with Zero Trust

Simplify security and make it more effective



**Classic Approach**  
Restrict everything to a 'secure' network



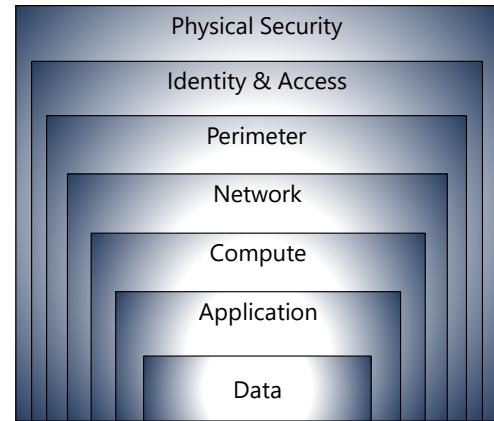
**Zero Trust**  
Protect assets anywhere with central policy

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## Defense in depth

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



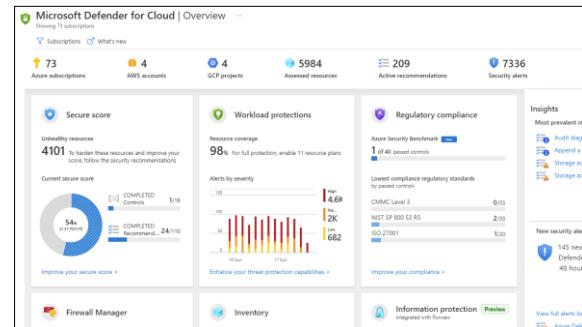
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## Microsoft Defender for Cloud

Microsoft Defender for Cloud is a monitoring service that provides threat protection across both Azure and on-premises datacenters.

- Provides security recommendations
- Detect and block malware
- Analyze and identify potential attacks
- Just-in-time access control for ports

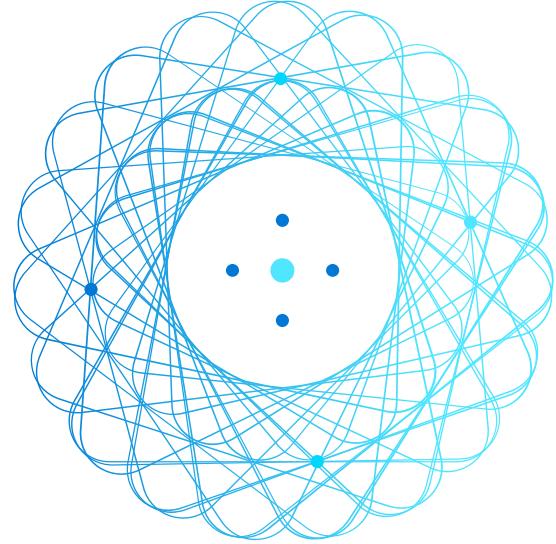


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# Learning Path 03: Management and Governance



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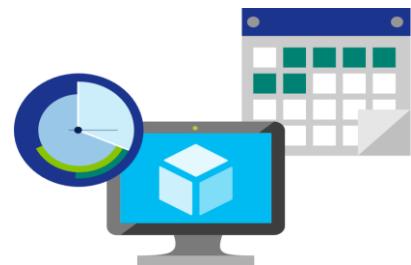
Cost management



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## Factors affecting costs (part 1)



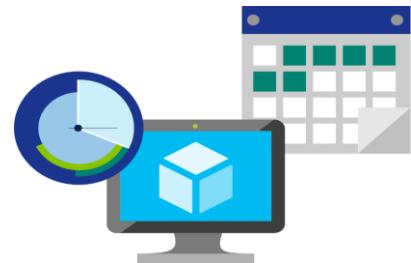
These are some of the factors affecting costs:

1) Resource Type	2) Consumption	3) Maintenance
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.	With a pay-as-you-go model, consumption is one of the biggest drivers of costs.	Monitoring your Azure footprint and maintaining your environment can help you identify and mitigate costs that aren't necessary, such as shutting down under used virtual machines.

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## Factors affecting costs (part 2)



These are some of the factors affecting costs:

4) Geography	5) Network traffic	6) Subscription
The same resource type can cost different amounts depending on the geographic area, so geography has an impact on Azure costs.	While some inbound data transfers are free, the cost for outbound data or data between Azure resources is impacted by Billing zones.	The type and configuration of your subscription can also impact your cost. For example, the free trial lets you explore some Azure resources for free.

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## Explore Azure Marketplace

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

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



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## Pricing Calculator

The **Pricing Calculator** is a tool that helps you estimate the cost of Azure products. The options that you can configure in the Pricing Calculator vary between products, but basic configuration options include:

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

Your Estimate

Virtual Machines
1 D2 v3 (2 vCPUs, 8 GB RAM) x 730 Hours ...
Upfront: USD 0.00
Monthly: USD

---

**Virtual Machines**

REGION:	OPERATING SYSTEM:	TYPE:	TIER:
West US	Windows	(OS Only)	Standard

CATEGORY:	INSTANCE SERIES:	INSTANCE:
All	All	D2 v3: 2 vCPUs, 8 GB RAM, 50 GB Temporary storage, USD 0.209/hour

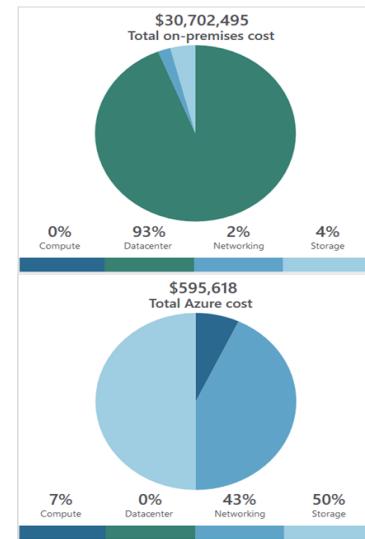
Virtual machines	
1	x
730	Hours

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## Total Cost of Ownership Calculator

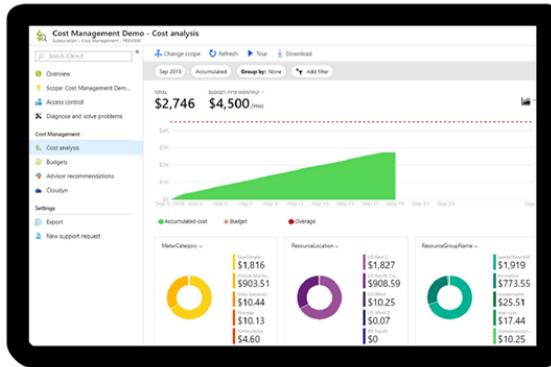
- A tool to estimate cost savings you can realize by migrating to Azure.
- A report compares the costs of on-premises infrastructures with the costs of using Azure products and services in the cloud.



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## Azure Cost Management



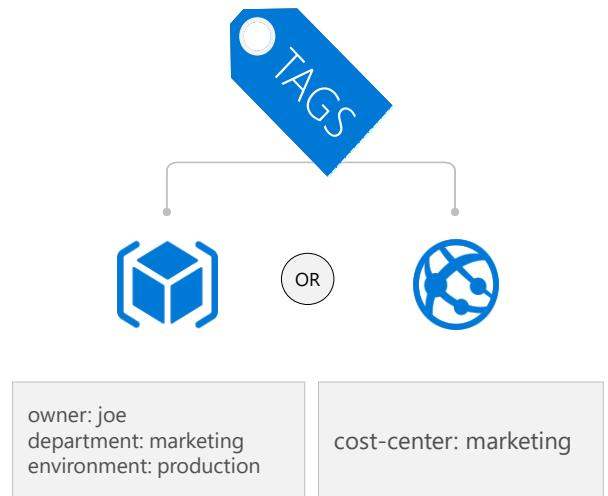
- Reporting – billing reports
- Data enrichment
- Budgets – set spend budget
- Alerting – when cost exceed limits
- Recommendation – cost recommendations

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## Tags

- Provides metadata for your Azure resources.
- Logically organizes resources into a taxonomy.
- Consists of a name-value pair.
- Very useful for rolling up billing information.



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## Governance and compliance



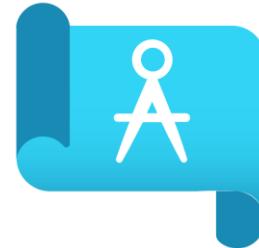
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## Azure Blueprints

**Azure Blueprints** makes it possible for development teams to rapidly build and stand up new environments. Development teams can quickly build trust through organizational compliance with a set of built-in components (such as networking) in order to speed up development and delivery.

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



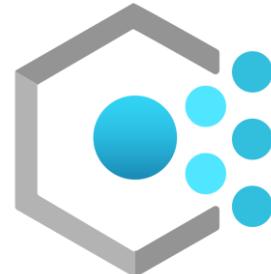
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## Azure Policy

**Azure Policy** helps to enforce organizational standards and to assess compliance at-scale. Provides governance and resource consistency with regulatory compliance, security, cost, and management.

- Evaluates and identifies Azure resources that do not comply with your policies.
- Provides built-in policy and initiative definitions, under categories such as Storage, Networking, Compute, Security Center, and Monitoring.



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## Resource locks

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

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

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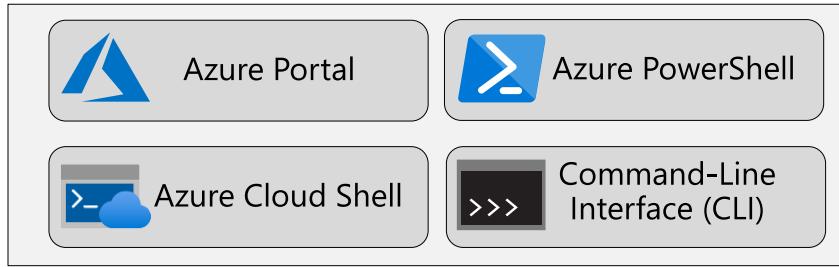
## Management and deployment tools



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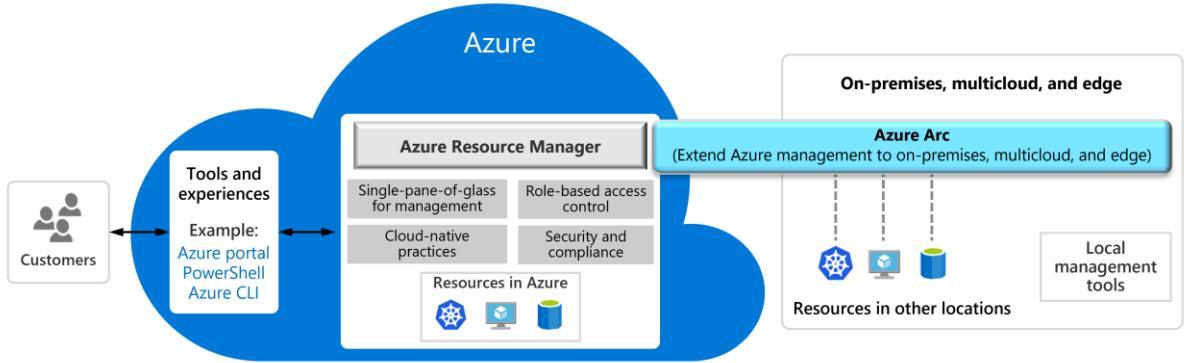
## Tools for interacting with Azure



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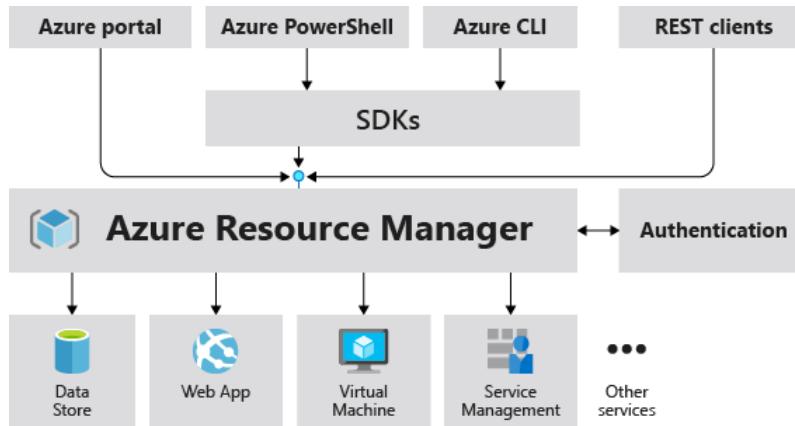
## Azure Arc



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## Azure Resource Manager



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

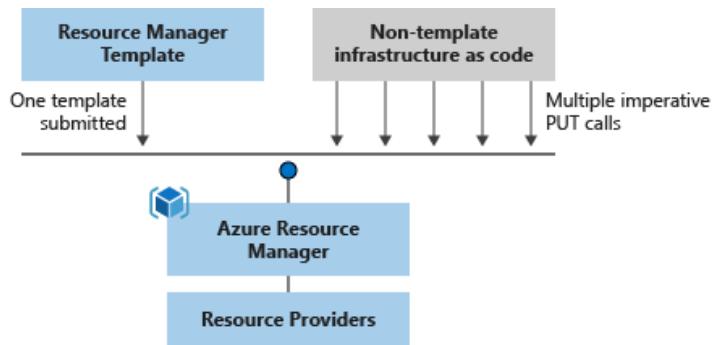
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## Azure Resource Manager (ARM) templates

Azure Resource Manager (ARM) templates are JavaScript Object Notation (JSON) files that can be used to create and deploy Azure infrastructure without having to write programming commands.

- Declarative syntax
- Repeatable results
- Orchestration
- Modular files
- Built-in validation
- Exportable code



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## Azure monitoring tools



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## Azure Advisor



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

- Reliability
- Security
- Performance
- Cost
- Operational Excellence



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## Azure Service Health

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

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

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

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



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## Azure Monitor

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

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



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... Thank You...

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