Cloud Understanding

Dr. A. Suresh, INSOFE

RECAP

- Problems of IT Infrastructure
- How to solve
- Cloud definition
- When to choose

Problems of IT Infrastructure

- Dependency issues if we need to upgrade our systems when new versions arrive

- Need of increased IT Infrastructure when there is an increase in employee

- Need of increased IT infrastructure to support increased customer demand when the customer base is increased from hundreds to thousands and many more over the same period

- Need to dispose off unused office infrastructure in case of recession when company will plan to cut down on operating cost and the workforce as well

Problems of IT Infrastructure contd.,

- Uneven business scenarios
- Over Cost Expenditure - purchasing and disposing of the IT Infrastructure
- Unstable Work Environment - hiring and firing of employees
- Uneven requirement of hardware - servers, desktops and other network related hardware

How to solve?

- Outsourcing the hardware
- Renting the IT infrastructure if needed
- Someone maintains the IT infrastructure

Conclusion:

Company will get the required infrastructure on demand(rent) as a service. It pays only according to what it uses and till when it uses.

Cloud Computing

(NIST) defines cloud computing as “a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.”

- “XaaS”
- X - everything as a Service

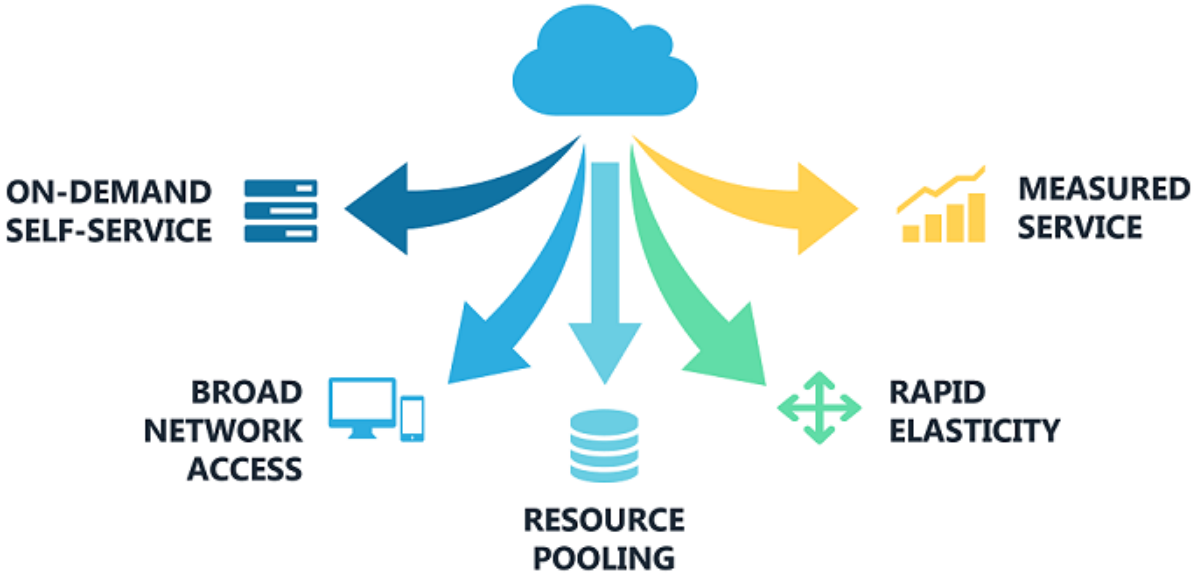
Source: www.nist.gov/itl/csd/cloud-102511.cfm

When to choose?

- Access information from anywhere; through secure APIs
- Focus on Business than IT
- Renting the IT infrastructure if needed
- Someone maintains the IT infrastructure
- Monthly online subscription – Pay per use Model
- Dynamically scale up the available resources, instantly, on-demand
- Multi-tenant environment

Characteristics of the Cloud Computing

The National Institute of Standards and Technology (NIST) defines cloud computing as it is known today through five particular characteristics.



https://cic.gsa.gov/basics/cloud-basics/

When to choose?

- Access information from anywhere; through secure APIs
- Focus on Business than IT
- Renting the IT infrastructure if needed
- Someone maintains the IT infrastructure
- Monthly online subscription – Pay per use Model
- Dynamically scale up the available resources, instantly, on-demand
- Multi-tenant environment

XaaS (what can be rented?)

Rent VMs or physical servers

platform

MySQL

Rent a

Ex: Azure

application

Rent a software

Ex: Office 365

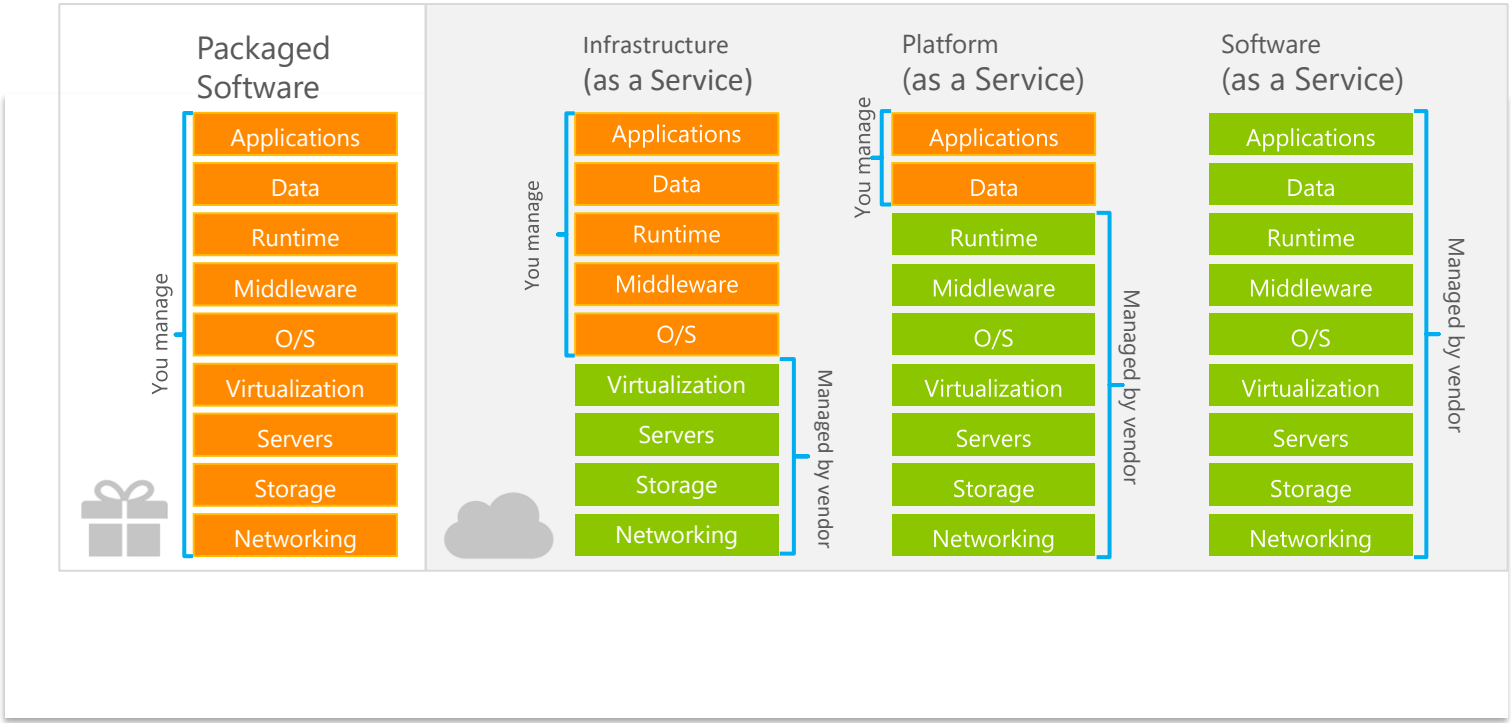
Pizza as a Service

Traditional On-Premises (Legacy)	Infrastructure as a service (IaaS)	Platform as a service (Paas)	Software as a service (Saas)
Dining Table	Dining Table	Dining Table	Dining Table
Drinks	Drinks	Drinks	Drinks
Electric / Gas	Electric / Gas	Electric / Gas	Electric / Gas
Oven	Oven	Oven	Oven
Fire	Fire	Fire	Fire
Pizza Dough	Pizza Dough	Pizza Dough	Pizza Dough
Tomato Sauce	Tomato Sauce	Tomato Sauce	Tomato Sauce
Toppings	Toppings	Toppings	Toppings
Cheese	Cheese	Cheese	Cheese
Made at Home	Take and Bake	Pizza Delivery	Dining Out

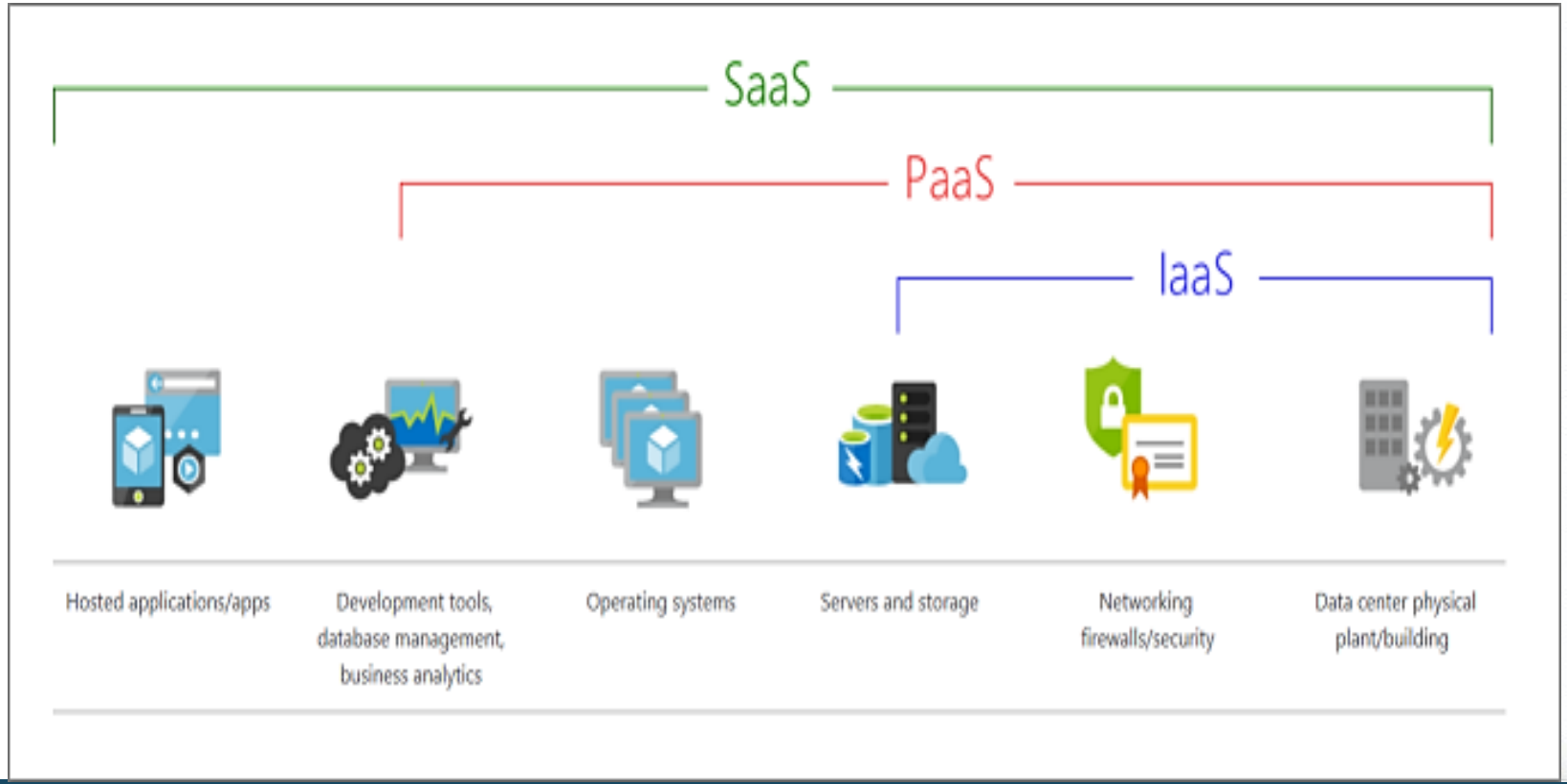
You Manage Vendor Manages

This was originally published originally by Albert Barron at IBM

XaaS (What can be rented?)



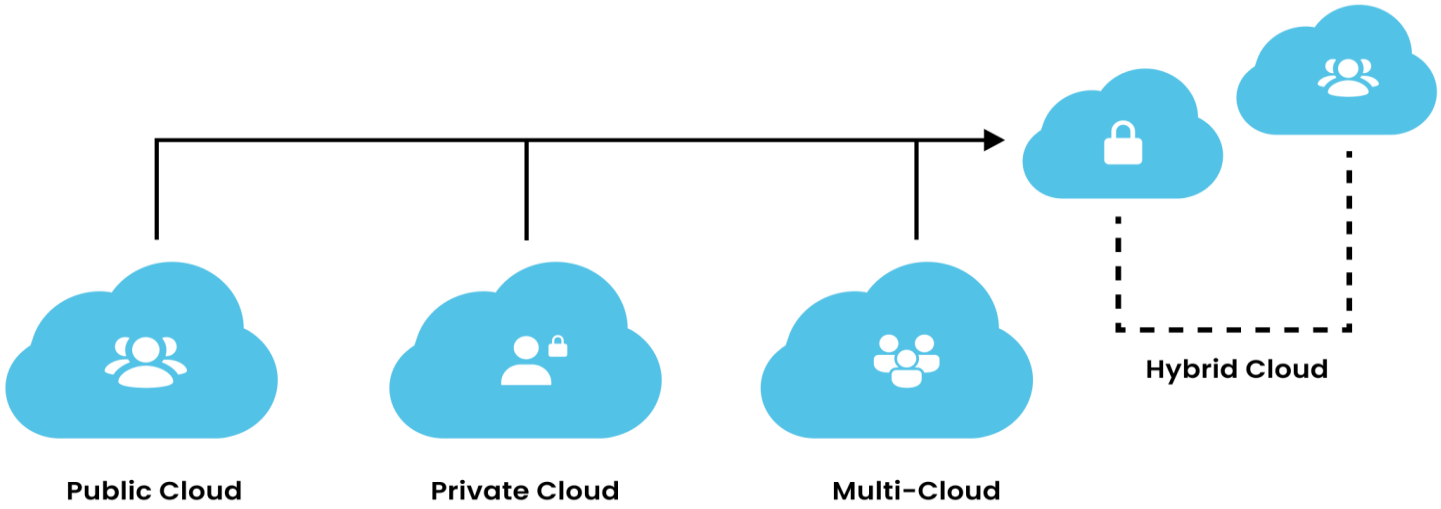
XaaS (what can be rented?)



Service	Abbr.
Analytics as a service	AnaaS
API as a service	AaaS
Artificial intelligence as a service	AIaaS
Backend as a service	BaaS
Banking as a service	BaaS
Blockchain as a service	
Business process as a service	BPaaS
Contact Information as a service	CIaaS
Content as a service	CaaS
Construction as a service	
Container as a service	
Crane as a service	
Communications as a Service	CPaaS
Data as a service	DaaS
Desktop as a service	
Drone as a service	
Database as a service	DBaaS
Distribution as a service	DaaS
Energy storage as a service	ESaaS
Electric vehicle as a service [2]	EVaaS
Function as a service	FaaS
Farming as a service	FaaS
Games as a service	GaaS
Hadoop as a service	HaaS
Housing as a service	
Infrastructure as a service	IaaS
Identity as a service	IDaaS
IT as a service	ITaaS
Logging as a service	LaaS
Management as a service	MaaS
Microgrid as a service	
Mobility as a service	
Monitoring as a service	
Metal as a service	
Mobile backend as a service	MBaaS
Machine Learning as a service	MLaaS
Network as a service	NaaS
Network Defense as a service	NDaaS
Payments as a service	PaaS
Platform as a service	
Push notification as a service	
Recovery as a service	RaaS
Robot as a service	
Search as a service	SaaS
Security as a service	
Software as a service	
Storage as a service	
Transportation as a service	TaaS
Testing as a service	TaaS
Unified Communications as a Service	UCaaS

https://docs.microsoft.com/en-us/learn/modules/fundamental-azure-concepts/categories-of-cloud-services

Deployment Models



Deployment Models

Private Cloud

Resources used exclusively by one organization

Public Cloud

Resources shared by multiple organizations

On-Premise vs. Hosted

- On-Premise (On-Prem): resources located locally
- Hosted: resources hosted and managed by a third-party (cloud provider)

Deployment Models

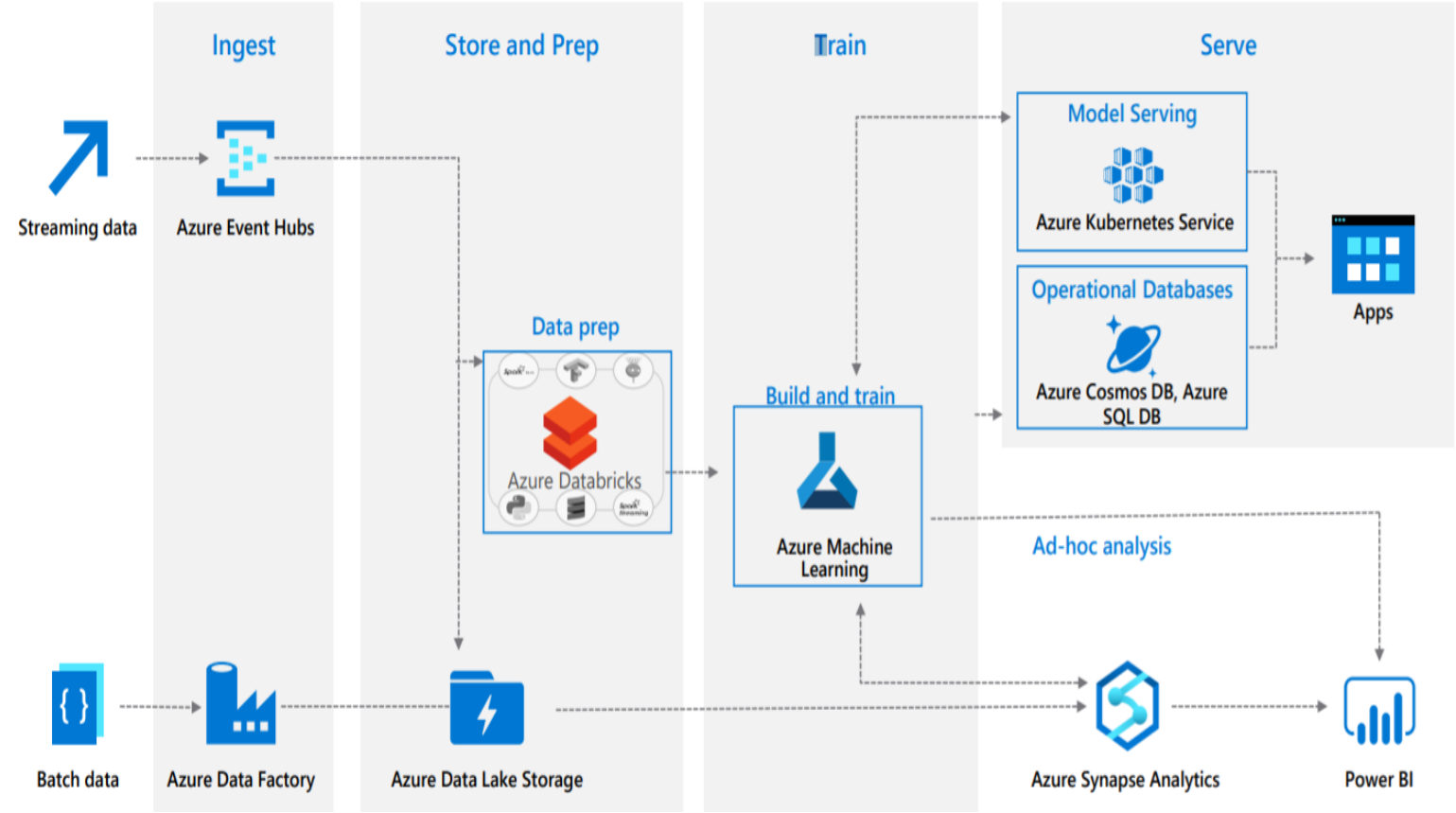
Private cloud can be both on-prem and hosted (virtual private cloud)

Hybrid Cloud:

Combine private (usually on-prem private) cloud and public cloud

- Better control over sensitive data/functionalities
- Cost effective
- Scales well
- Flexible

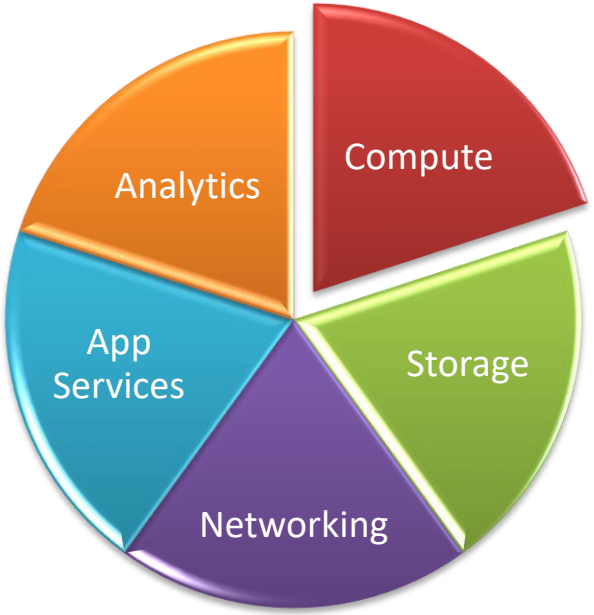
Advanced analytics pattern in Azure



What is Azure?

- A Cloud Computing Platform from Microsoft
- Released as Windows Azure in February 2010
  Renamed to Microsoft Azure on March 25, 2014
- Provides a web portal to access and manage cloud services & resources.
- Free to start, pay-per-use

Azure Cloud Services



Azure Global Infrastructure

1.Data centers

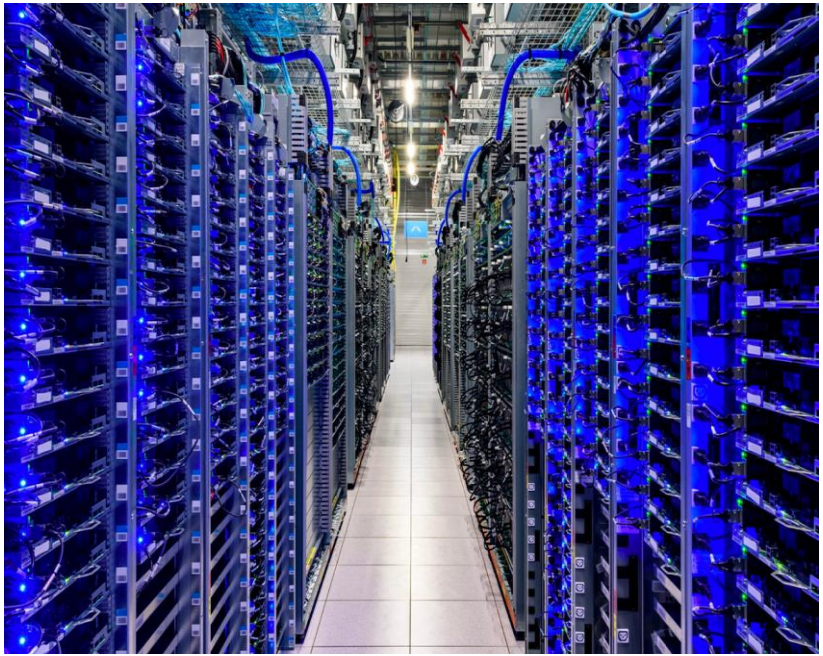
2.Regions

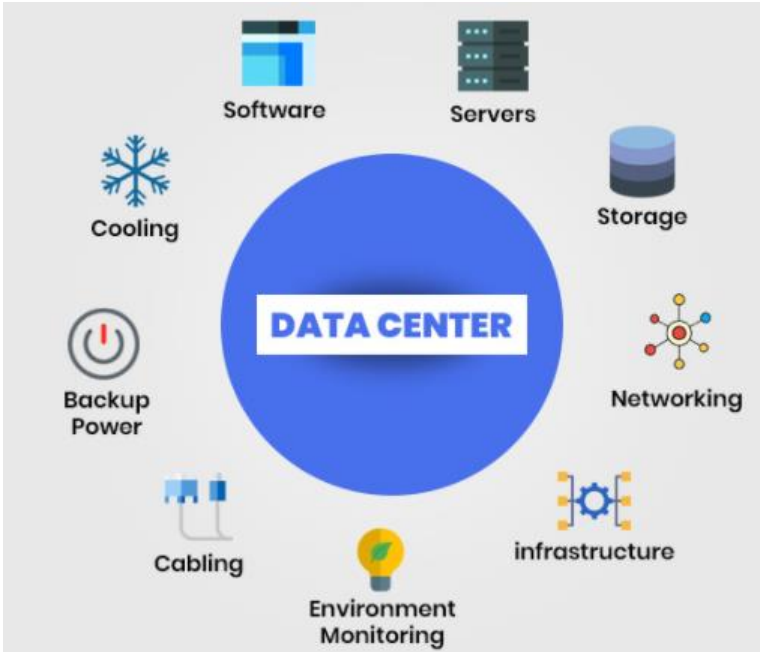
3.Geographies

4.Availability Zones

5.Region Pairs

Data Centers





https://news.microsoft.com/innovation-stories/project-natick-underwater-datacenter/

Azure Regions

- Location for your resources
- Area containing at least one datacenter
- Select a region when deploying a resource

Azure regions

Why Geographics/Regions?

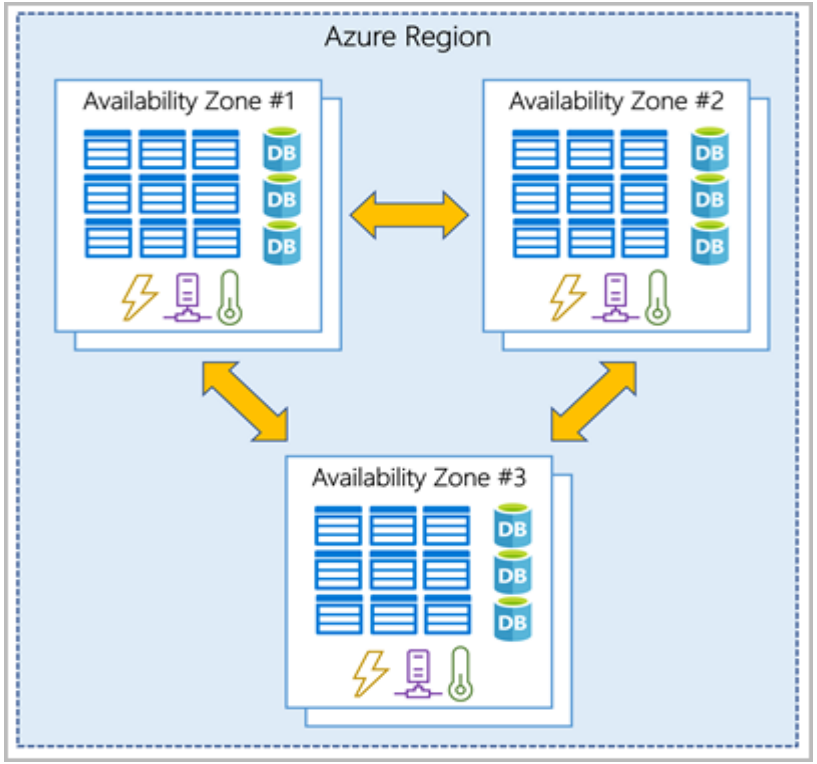
An Azure geography is an area of the world that contains at least one Azure region.
Ex: United States, United Kingdom, India, Asia Pacific etc

Redundancy
Specialized services
Data requirements met in boundaries

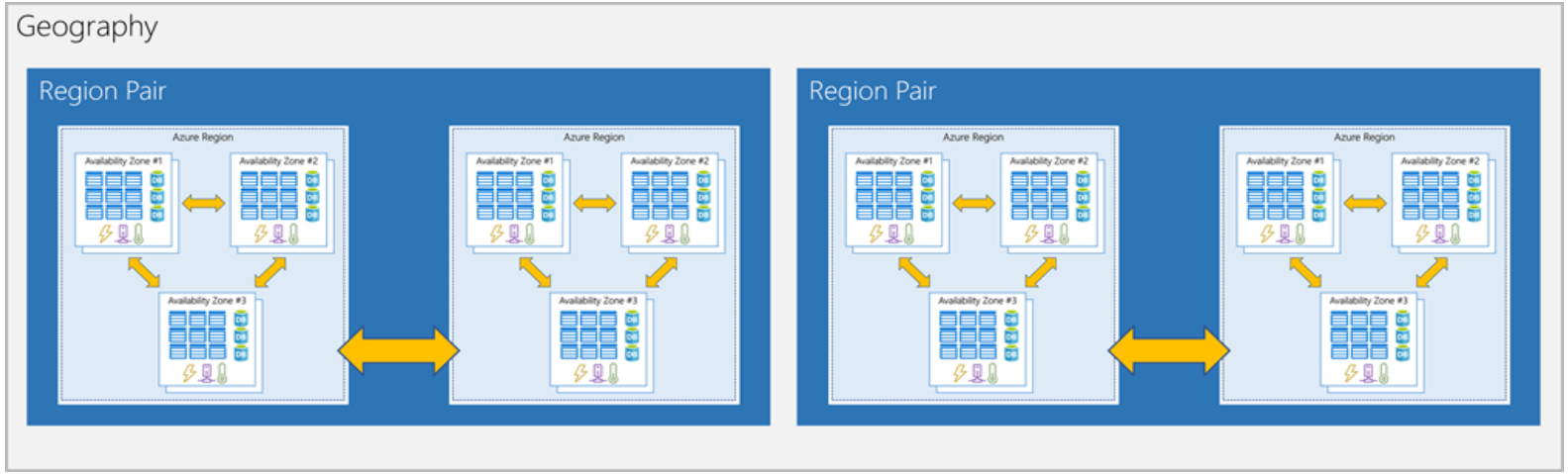
- Residency(physical or Geographic location of Organizations data
- Sovereignty
- Compliance
- Resiliency

Azure availability zones

Availability zones are physically separate datacenters within an Azure region. Each availability zone is made up of one or more datacenters equipped with independent power, cooling, and networking. An availability zone is set up to be an *isolation boundary*. If one zone goes down, the other continues working. Availability zones are connected through high-speed, private fiber-optic networks.



Azure region pairs



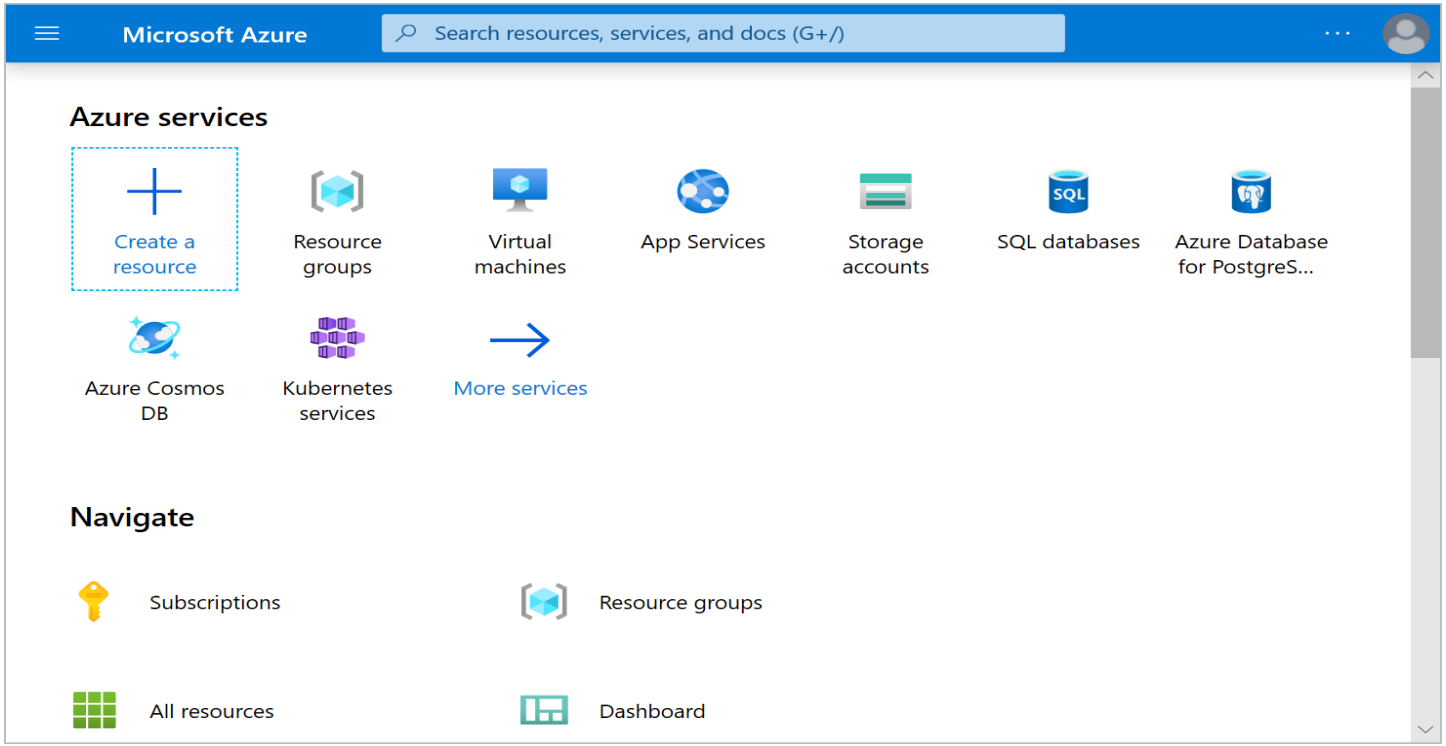
Each Azure region is always paired with another region within the same geography (such as US, Europe, or Asia) at least 300 miles away. This approach allows for the replication of resources (such as VM storage) across a geography that helps reduce the likelihood of interruptions because of events such as natural disasters, civil unrest, power outages, or physical network outages that affect both regions at once. If a region in a pair was affected by a natural disaster, for instance, services would automatically failover to the other region in its region pair.

Examples of region pairs in Azure are West US paired with East US and South East Asia paired with East Asia.

Azure region pairs

Geography	Regional Pair A	Regional Pair B
Canada	Canada Central	Canada East
China	China North	China East
India	Central India	South India
Japan	Japan East	Japan West
North America	East US	West US

Azure Portal



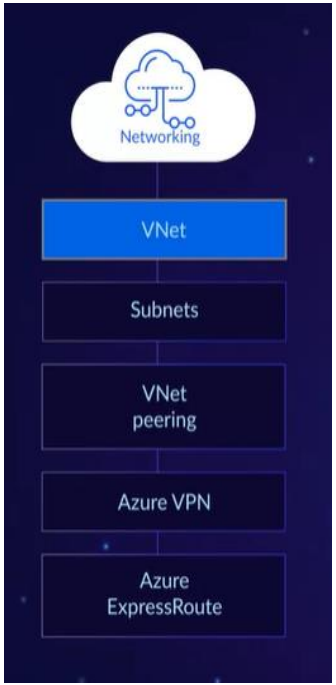
Azure Free Account

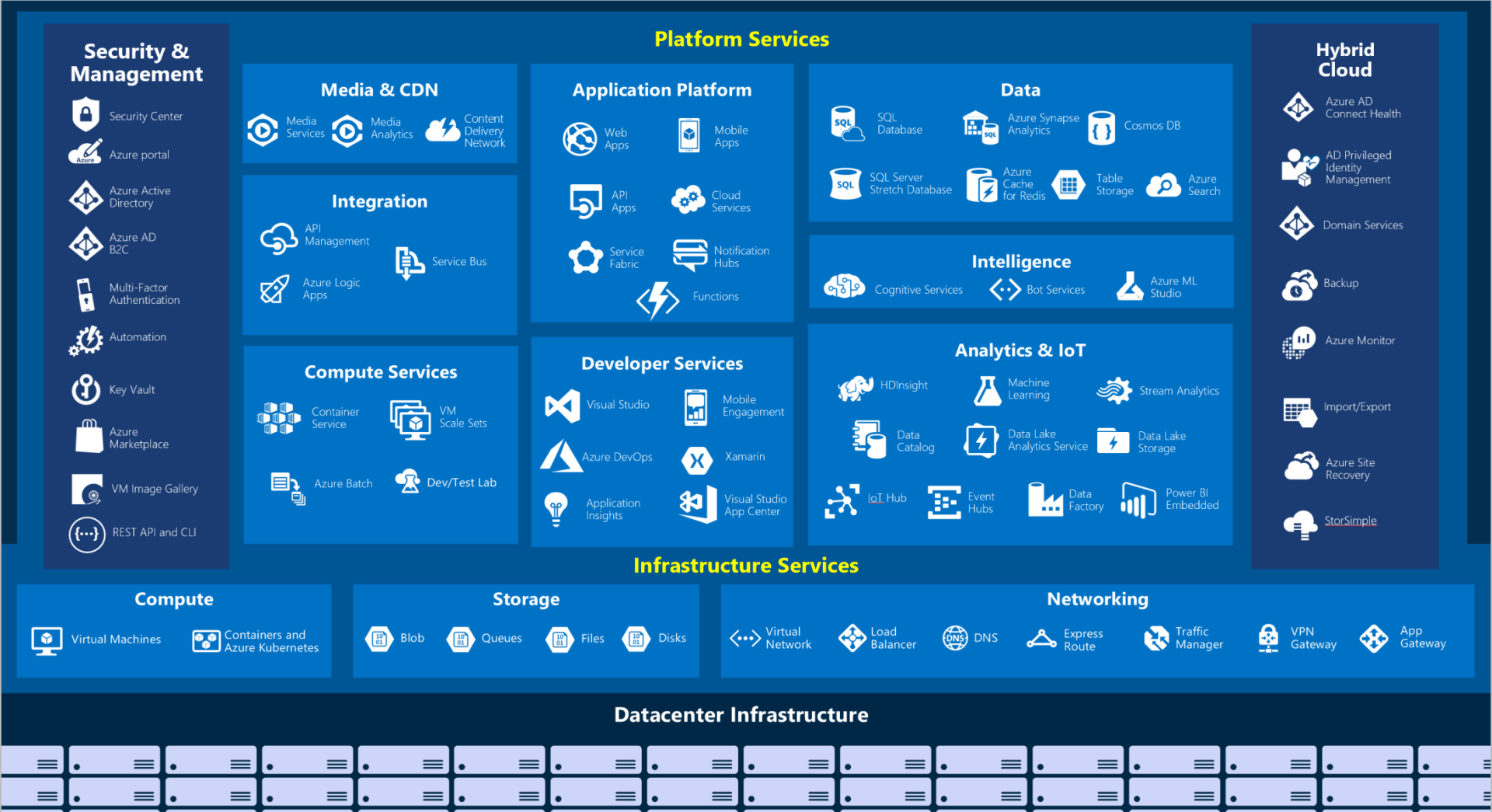
- Free product and services for 12 months
- $200 Azure credit for first 30 days
- 25+ services are always free
- 10 web, mobile, or API apps
- 5 GB blob storage to store unstructured data
- 5 GB file storage
- You can create up to 250 GB of SQL database
- 15 GB data transfer bandwidth
- 750 hours Windows virtual machine
- 750 hours Linux virtual machine
- Free batch job
- Free SQL Server 2017 Developer Edition
- Free Visual Studio Code
- Free Machine Learning Server etc.
- Free DevTest Labs
- Free Load Balancer and lot more

Demo : Azure Portal

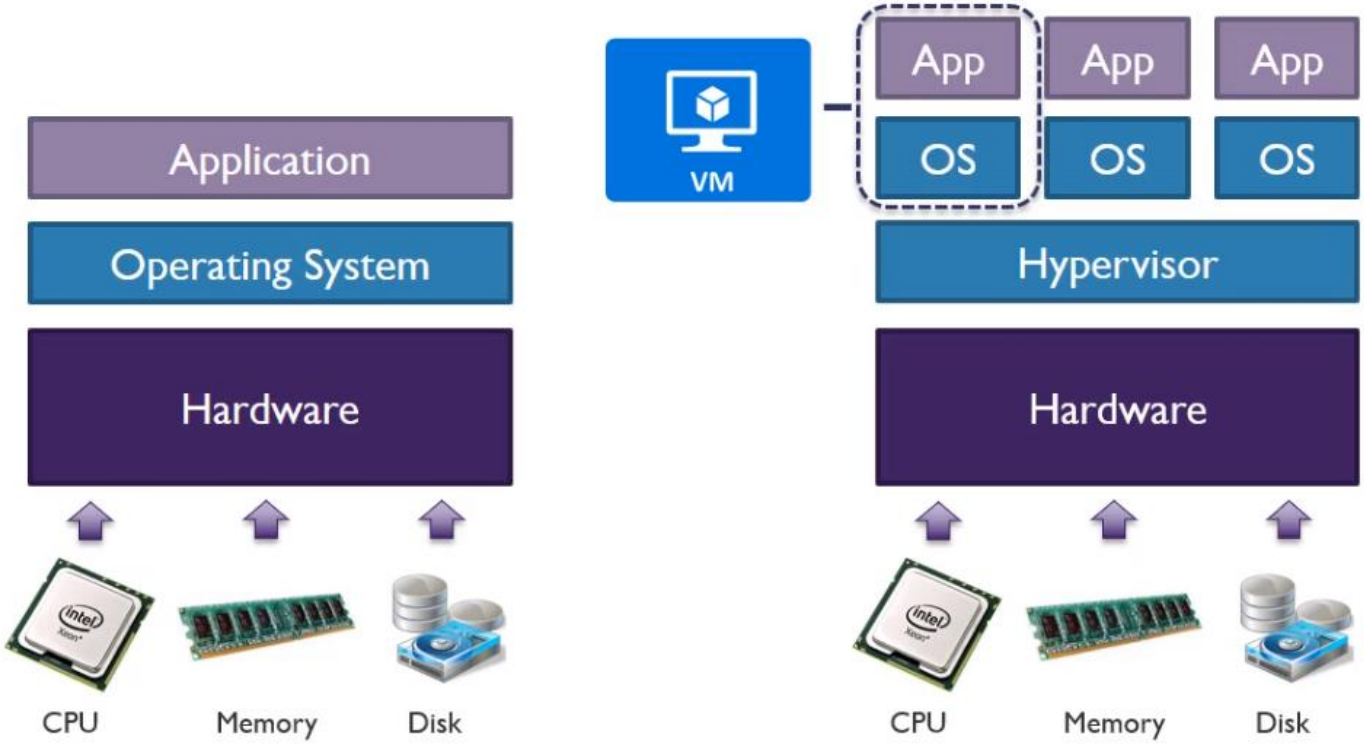
Create Azure Account - *http://portal.azure.com*
Observe the services in Azure Portal & Marketplace

Azure 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
Platform Services
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
Azure Synapse Analytics
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

Introduction to Virtual Machines



Compute – Virtual machines

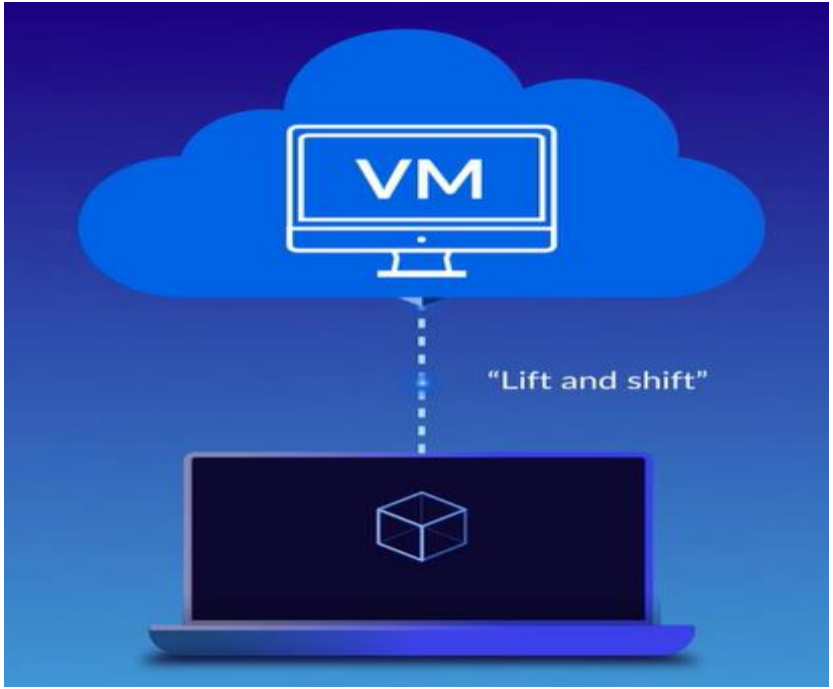
Software emulation of a physical computer

Includes:

- Virtual processor
- Memory
- Storage
- Networking resources

Unlike containers, VMs host an OS

Compute – Virtual machines



VM Types

Type	Purpose
A - Basic	Basic version of the A series for testing and development.
A – Standard	General-purpose VMs.
B – Burstable	Burstable instances that can burst to the full capacity of the CPU when needed.
D – General Purpose	Built for enterprise applications. DS instances offer premium storage.
E – Memory Optimized	High memory-to-CPU core ratio. ES instances offer premium storage.
F – CPU Optimized	High CPU core-to-memory ratio. FS instances offer premium storage.
G - Godzilla	Very large instances ideal for large databases and big data use cases.

VM Types

Type	Purpose
H – High performance compute	High performance compute instances aimed at very high-end computational needs such as molecular modelling and other scientific applications.
L – Storage optimized	Storage optimized instances which offer a higher disk throughput and IO.
M – Large memory	Another large-scale memory option that allows for up to 3.5 TB of RAM.
N – GPU enabled	GPU-enabled instances.
SAP HANA on Azure Certified Instances	Specialized instances purposely built and certified for running SAP HANA.

Maintenance & Downtime

Unexpected Downtime

When a VM fails unexpectedly

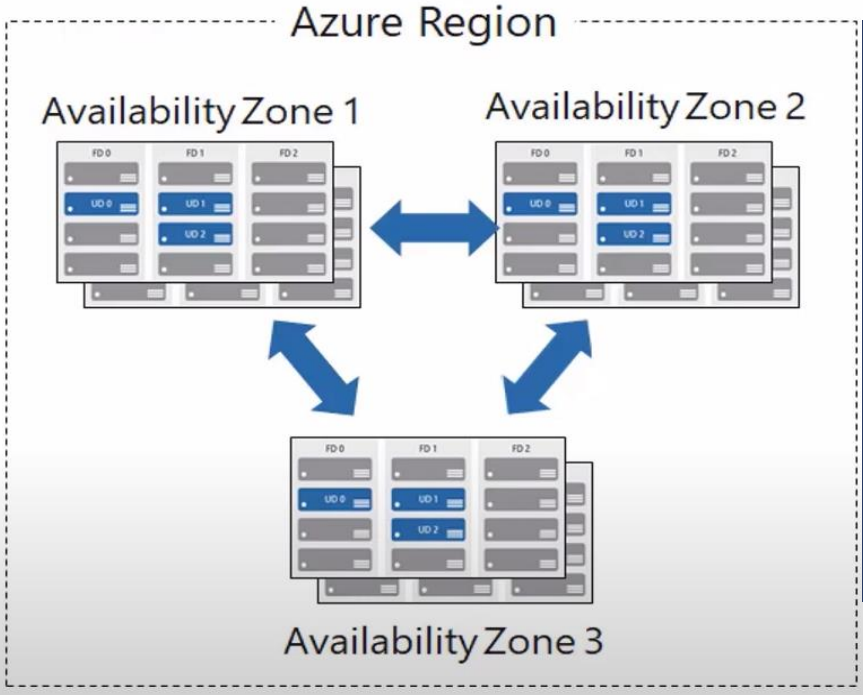
Unplanned Hardware Maintenance

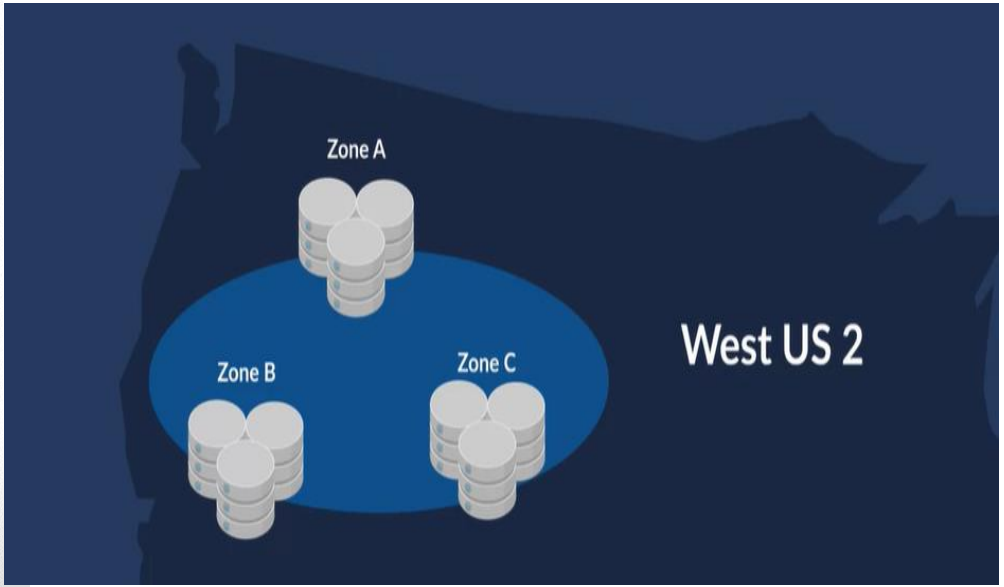
VM fails due to hardware issue

Planned Maintenance

Periodic updates by Microsoft that require VM reboot

Availability Zone

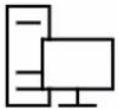




SLA for VM

VM SLA

99.9% with Premium Storage

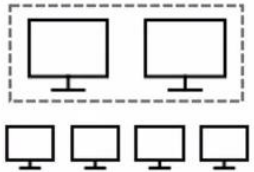


SINGLE VM

Easier lift and shift

VM SLA

99.95%

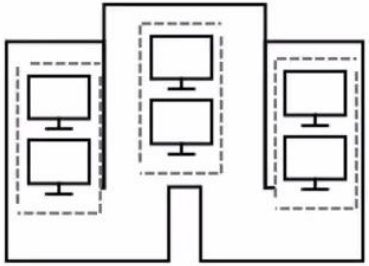


AVAILABILITY SETS

Protecting against failures within datacenters

VM SLA

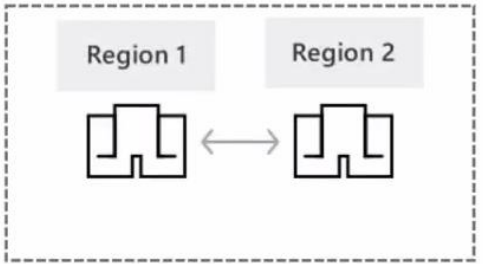
99.99%



AVAILABILITY ZONES

Protection from entire datacenter failures

MULTI-REGION DISASTER RECOVERY



REGION PAIRS

Regional protection within Data Residency Boundaries

Q&A ?