

CLOUD COMPUTING & MICROSOFT AZURE FUNDAMENTALS — FULL INSTRUCTOR MODULE

1 Overview of Cloud Computing

Cloud Computing =

Using IT resources (servers, storage, databases, networking, AI) over the internet, on a pay-as-you-go model.

Why Cloud?

Because companies don't want to:

- Buy hardware
- Maintain servers
- Handle electricity/cooling
- Manage security
- Spend crores before even starting

Cloud solves all these by giving **IT as a service**.

Key Benefits of Cloud Computing

Benefit	Explanation	Analogy
Cost Efficiency	Pay only for what you use	Like paying for electricity units
Scalability	Increase/decrease resources	Extra Uber cars added during peak hours
Flexibility	Choose any service anytime	Switching from 2BHK to 3BHK instantly
Global Reach	Deploy apps anywhere in world	Netflix available worldwide
Security	Multi-layer security, compliance	Bank-like protection
Maintenance-Free	Vendor handles hardware	Renting a furnished flat

CAPEX vs OPEX — Deep Explanation

CAPEX (Capital Expenditure)

- One-time cost
- Buy servers, networking, data center
- Not flexible
- High maintenance

Example:

A bank spending ₹3 Crores building a datacenter.

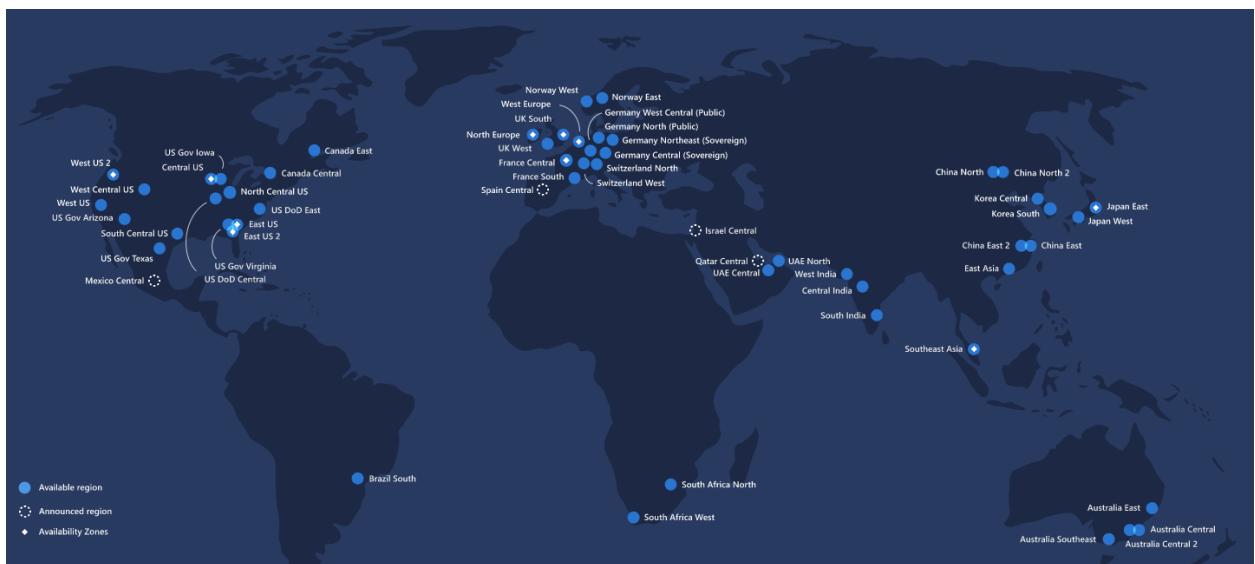
OPEX (Operational Expenditure)

- Monthly pay-as-you-go
- No upfront investment
- Very flexible
- Scales instantly

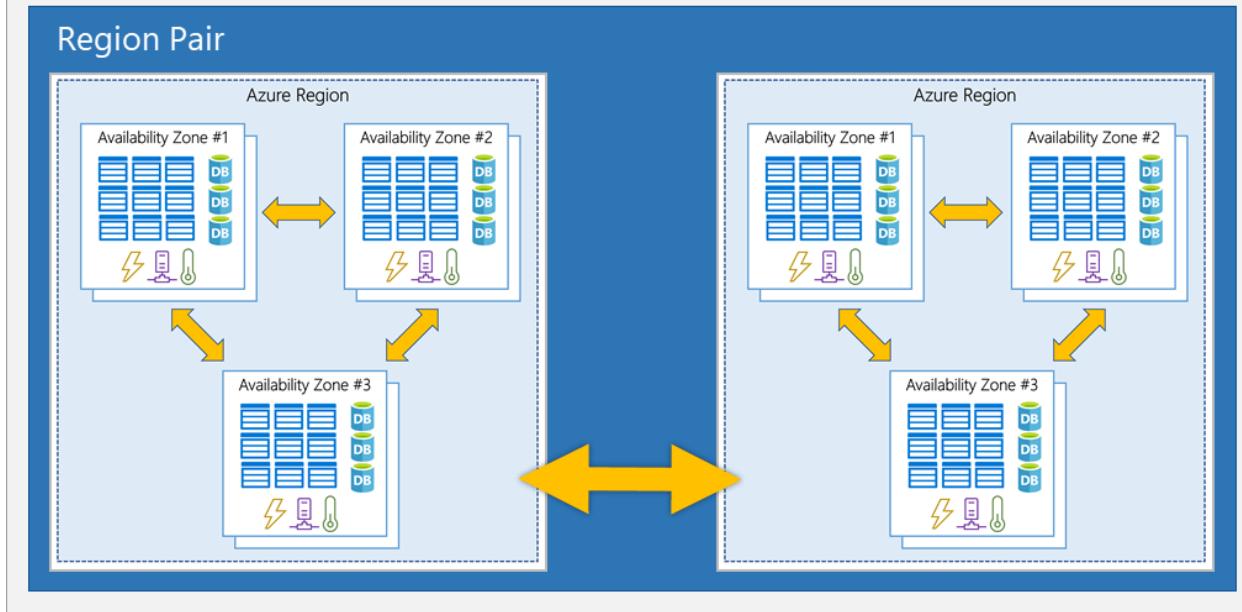
Example:

A startup pays ₹15,000/month for Azure VMs.

Datacenter, Region & Region Pairs



Geography



4

Datacenter

A physical building where Azure hosts servers.

Inside a datacenter:

- Thousands of servers
- High-speed networking
- Cooling systems
- Power backup
- Security surveillance

Azure Region

A geographic area containing **multiple datacenters**.

Examples:

- Central India (Pune)
- South India (Chennai)

- East US
- West Europe

Why Regions Matter?

- You place your application near your customers
- Better performance
- Lower latency
- Compliance (country regulations)

🌐 Region Pairs

Every Azure region is paired with another region **within the same geography**.

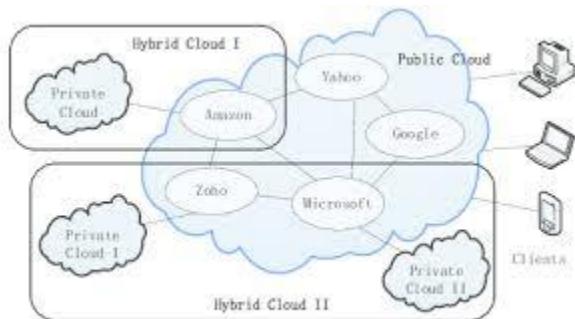
Examples:

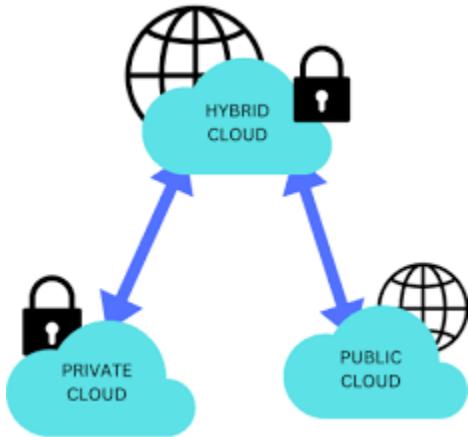
- Central India ↔ South India
- East US ↔ West US
- Japan East ↔ Japan West

Use Cases:

- ✓ Disaster Recovery
- ✓ Automatic Updates (one region at a time)
- ✓ Geo-redundant storage replication

3 Public, Private & Hybrid Cloud — Instructor-Friendly Explanation





🌐 Public Cloud

- Provided by vendors like Azure
- Shared physical infrastructure
- Pay as you use

👉 **Use Case:** Hosting websites, APIs, mobile backends

🏢 Private Cloud

- Dedicated for one organization
- On-prem or hosted
- Maximum security

👉 **Use Case:** Bank maintains customer KYC data privately.

🔗 Hybrid Cloud

Mix of:

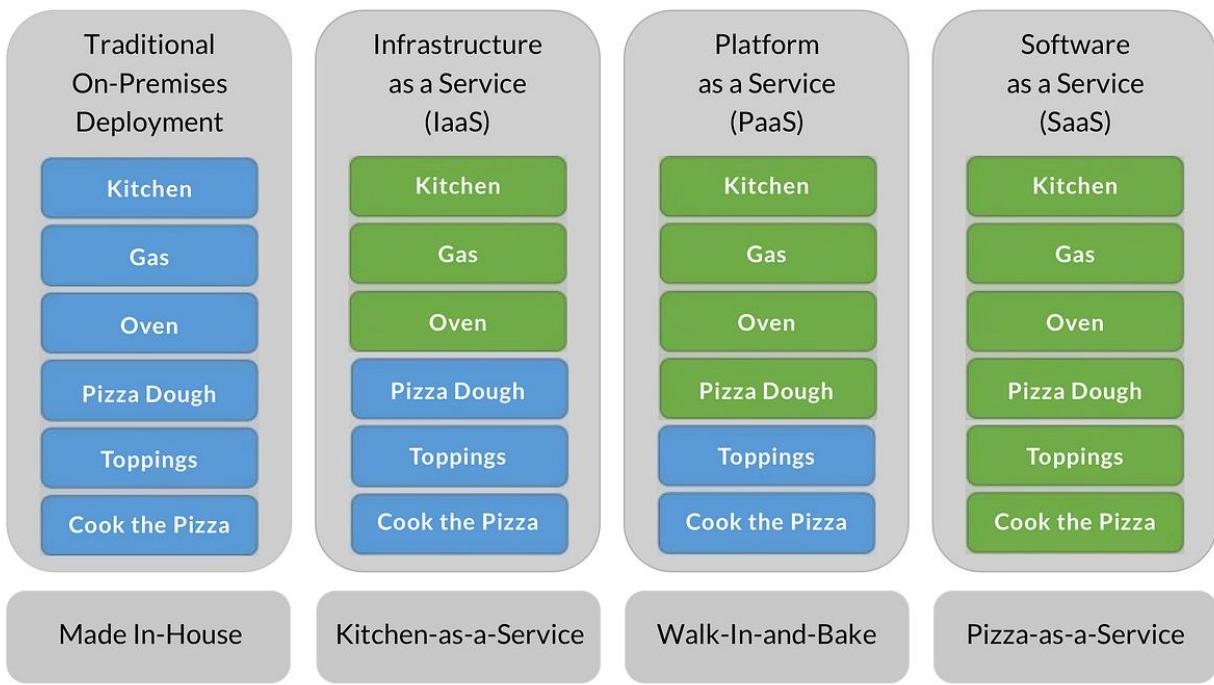
- On-prem (private cloud)
- Public cloud

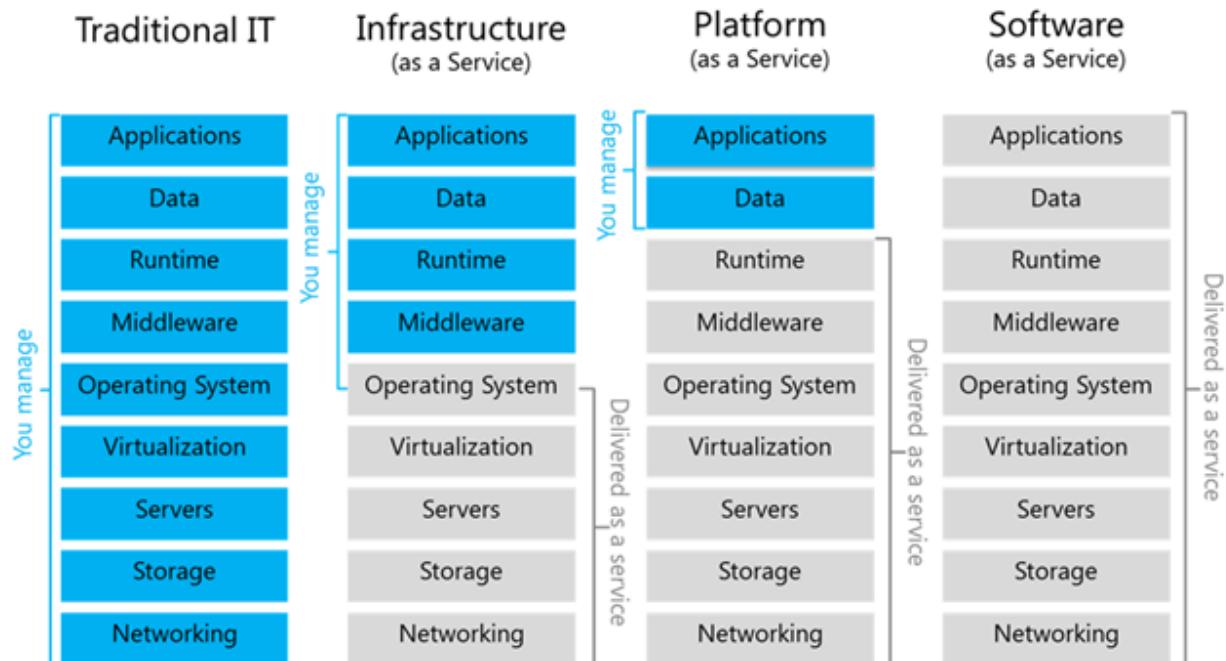
👉 **Use Case Example:**

A hospital stores patient records on-prem (private) but uses Azure for analytics (public).

4 IaaS, PaaS, SaaS — Deep Explanation with Analogies

New Pizza as a Service





🍕 Pizza Analogy (Most Effective for Students)

Model What You Manage Real-Life Analogy

On-Prem	Everything	Make pizza at home
IaaS	OS + apps	Buy raw pizza base, bake at home
PaaS	Only app	Order pizza home delivery
SaaS	Nothing	Eat pizza at restaurant

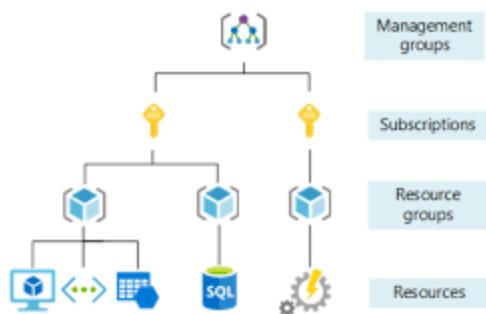
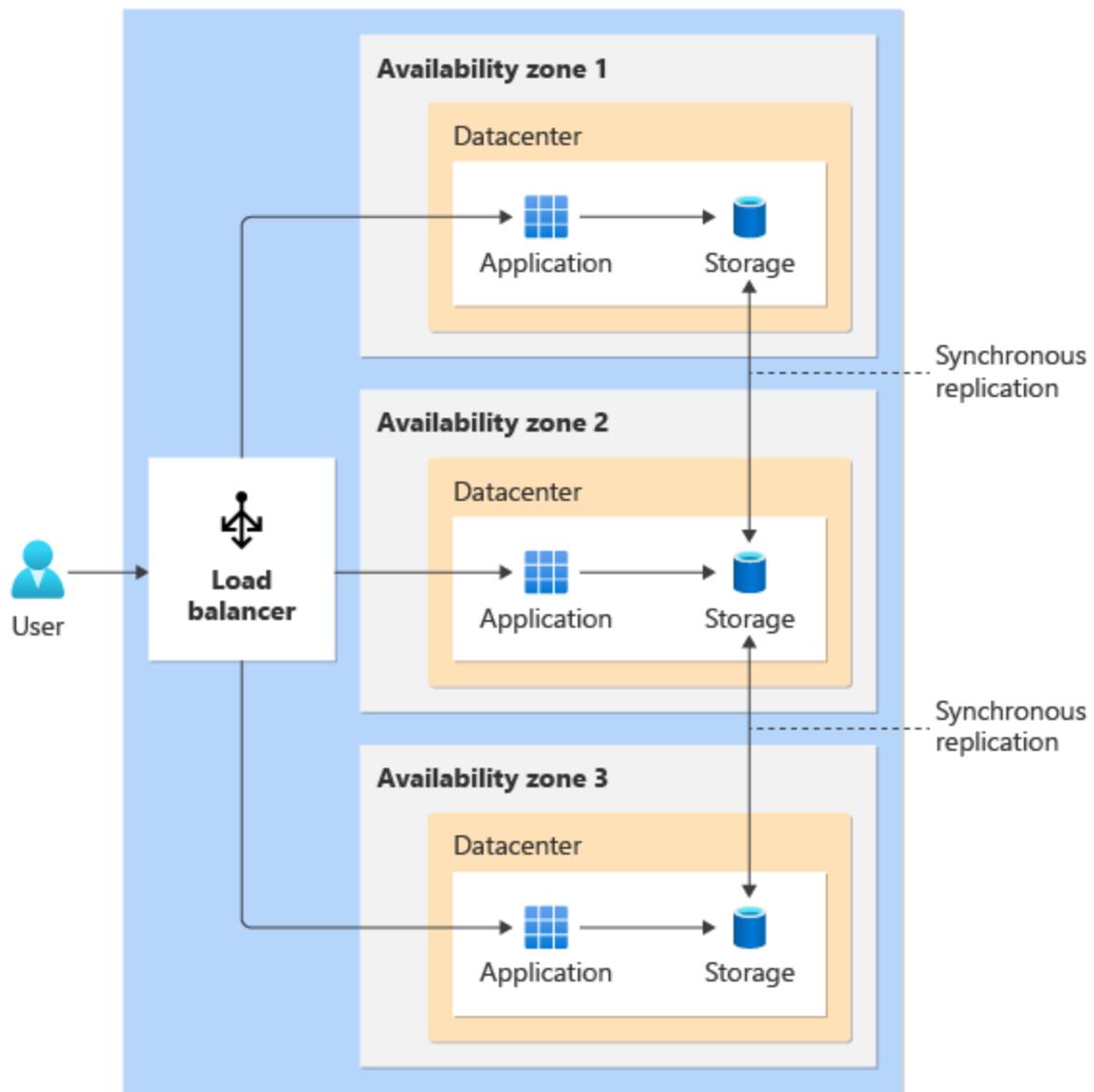
💻 Azure Service Examples

Model Azure Services

IaaS	VMs, VNet, Load Balancer
PaaS	Azure App Service, Azure SQL, Functions
SaaS	Office 365, Dynamics 365

5 Availability Zones, Resources, Resource Groups, ARM

Azure region



✿ Availability Zones (AZs)

Each region has 3+ physically isolated zones.

Use Case:

- Deploy VM1 in Zone 1
 - Deploy VM2 in Zone 2
 - Use a Load Balancer for high availability
-

Azure Resources

Anything you create:

- VM
 - Storage
 - Database
 - App Service
-

Resource Group (RG)

A **logical container** for resources.

Best Analogy:

RG = Folder, Resources = Files

Benefits:

- Easy deletion
 - Controlled access
 - Organized billing
-

Azure Resource Manager (ARM)

The management layer of Azure.

ARM handles:

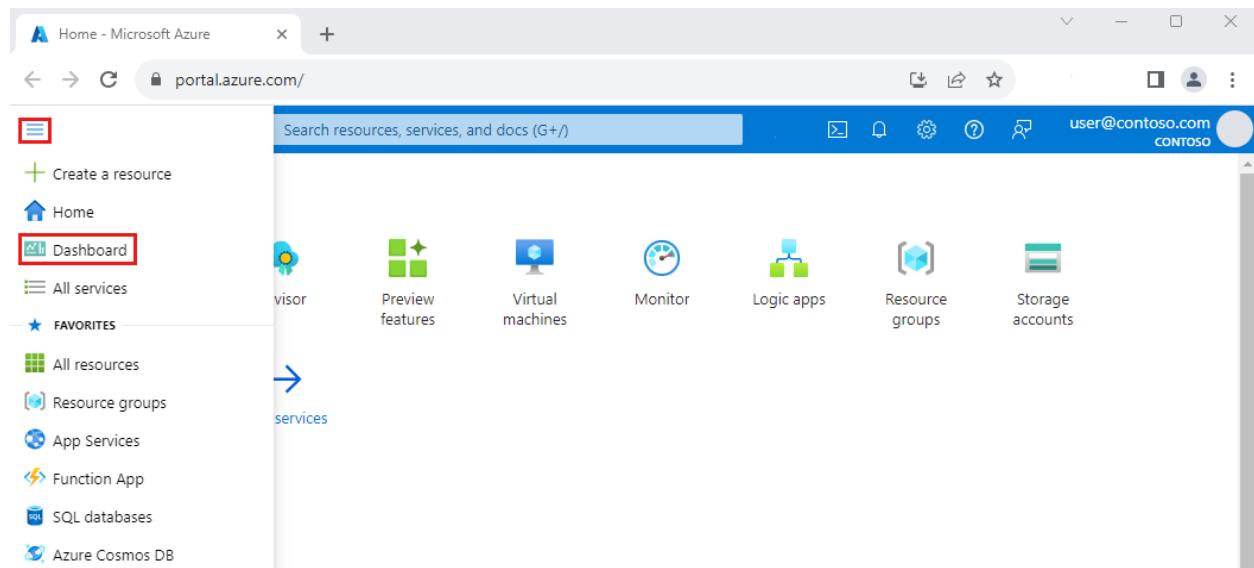
- Deployments

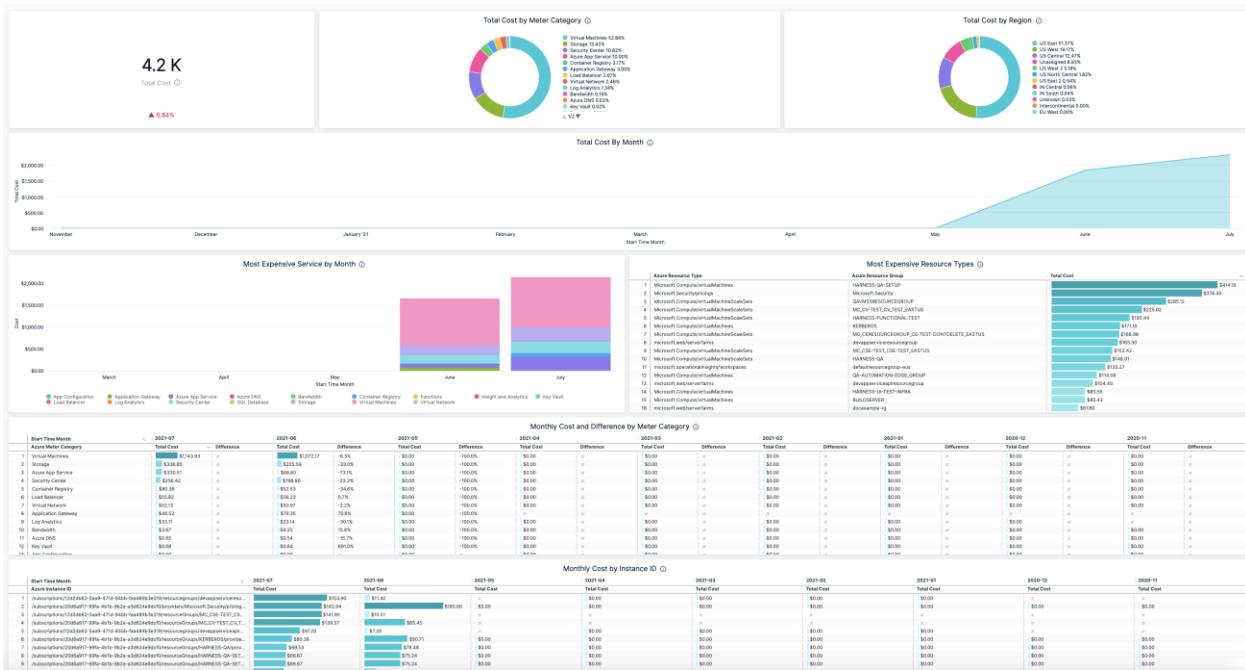
- Updates
- RBAC
- Tags
- Templates (ARM, Bicep, Terraform)

Analogy:

ARM = “Azure Police Officer” ensuring rules, security, and consistency.

6 Microsoft Azure Portal (Detailed Overview)





Azure Portal:

A web-based GUI to manage all Azure resources.

Main Features:

- Create and manage resources
- Monitor CPU, memory, logs
- Set budgets & cost alerts
- Deploy templates
- Manage RBAC
- Check health & recommendations



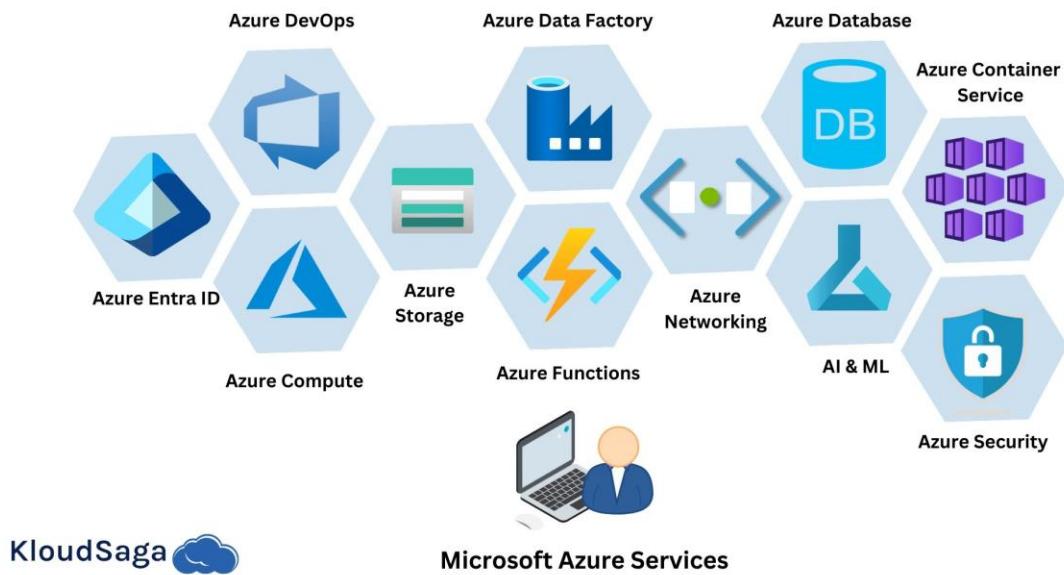
Cost Management & Utilization

- Cost Analysis
- Forecasting
- Budget alerts
- Optimization suggestions

Use Case:

If cost exceeds ₹20,000/month → send email alert.

7 Core Azure Services (Explain Like Real Trainer)



1. Compute Services

- Virtual Machines (VM)
 - Containers
 - Kubernetes Service (AKS)
 - App Services
 - Azure Functions (Serverless)
-

2. Storage Services

- Blob Storage
- Files

- Disks
 - Queues
 - Tables
-

3. Networking

- Virtual Network (VNet)
 - Subnets
 - Load Balancer
 - VPN Gateway
 - ExpressRoute
 - Application Gateway (WAF)
-

4. Identity

- Azure AD / Entra ID
 - RBAC
 - MFA
-

5. Databases

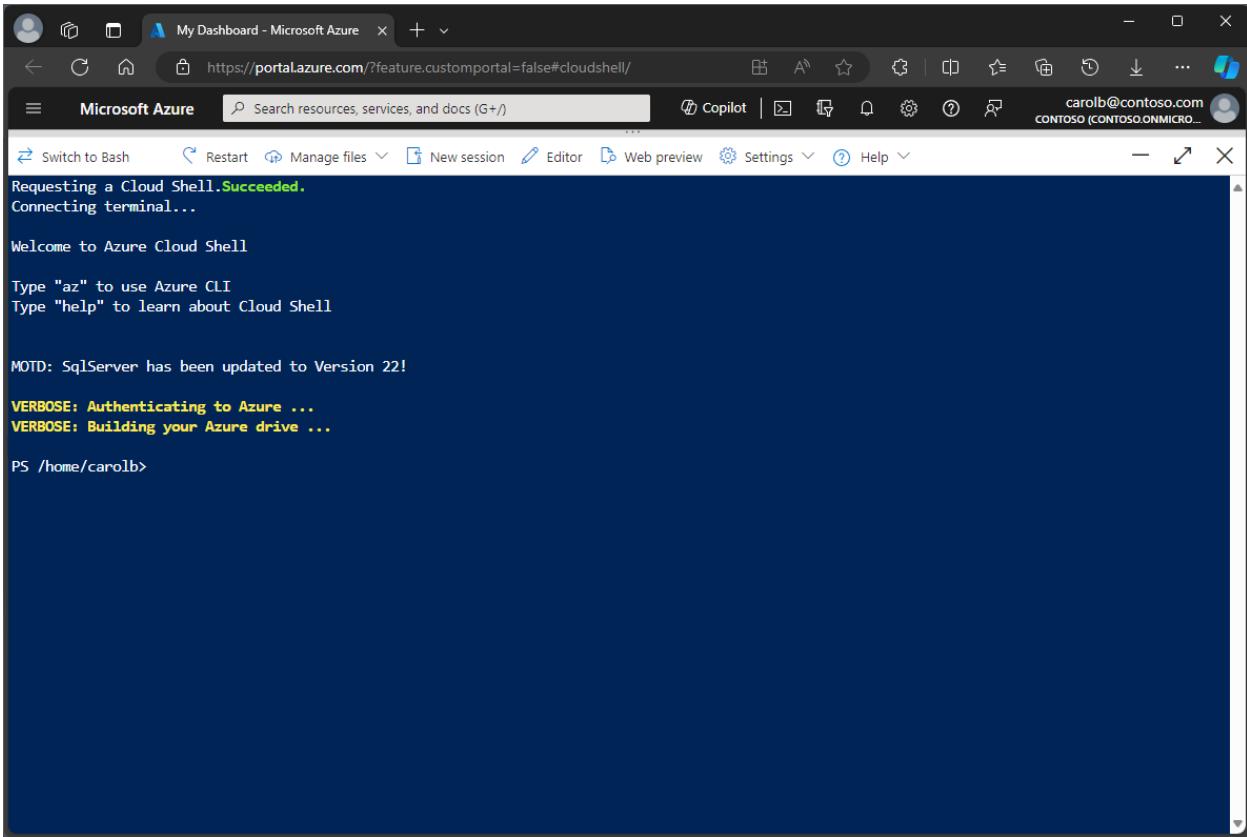
- Azure SQL
 - Cosmos DB
 - PostgreSQL / MySQL
 - Synapse Analytics
-

6. Monitoring

- Azure Monitor
- Log Analytics

- Application Insights
-

Azure Cloud Shell, PowerShell & CLI



The screenshot shows the Azure Cloud Shell interface in a web browser window. The title bar says "My Dashboard - Microsoft Azure". The address bar shows the URL <https://portal.azure.com/?feature.customportal=false#cloudshell/>. The main content area is titled "Microsoft Azure" and contains a search bar with "Search resources, services, and docs (G+/" and a Copilot button. Below the search bar is a toolbar with "Switch to Bash", "Restart", "Manage files", "New session", "Editor", "Web preview", "Settings", and "Help". The terminal window displays the following text:

```
Requesting a Cloud Shell.Succeeded.
Connecting terminal...
Welcome to Azure Cloud Shell
Type "az" to use Azure CLI
Type "help" to learn about Cloud Shell

MOTD: SqlServer has been updated to Version 22!

VERBOSE: Authenticating to Azure ...
VERBOSE: Building your Azure drive ...

PS /home/carolb>
```

Azure Powershell Vs Azure CLI



Feature	Azure PowerShell	Azure CLI
Command Language	PowerShell scripting language	Command-line interface (CLI)
Platform Support	Windows, macOS, Linux	Windows, macOS, Linux
Syntax Style	Verb-Noun (e.g., Get-AzResource)	Verb-Noun (e.g., az resource show)
Scripting Capabilities	Powerful scripting with access to .NET objects	Scripting through JSON payloads
Scripting Language	PowerShell scripting language	Shell scripting (bash, PowerShell)
Interactive Mode	Supports interactive scripting	Interactive command-line interface
Output Formats	Outputs objects (PowerShell objects)	Outputs JSON, table, and others
Resource Management	Azure Resource Manager (ARM) cmdlets	ARM commands
Integration	Deep integration with Windows ecosystem	Cross-platform, broader ecosystem integration
Updates and Installation	Updates through PowerShell Gallery	Updates through package managers (e.g., apt, yum)
Learning Curve	May be steeper for those unfamiliar with PowerShell	Generally easier for those familiar with command-line interfaces
Use Cases	Well-suited for Windows-centric environments, automation, and scripting tasks	Suitable for automation, cross-platform scenarios, and quick command-line tasks



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Azure Cloud Shell

Browser-based terminal with:

- Bash
- PowerShell
- Preinstalled tools (CLI, Git, Terraform)

Use Case:

Run commands without installing anything.

Azure PowerShell

Used by:

- Windows admins
- Automation scripts

Commands example:

```
New-AzResourceGroup -Name DemoRG -Location eastus
```

Azure CLI (Cross-platform)

Used by:

- Developers
- DevOps
- Linux teams

Commands example:

```
az group create --name DemoRG --location eastus
```

PRACTICAL DEMOS (Can be shown to students)

✓ 1. Create a Resource Group (CLI)

```
az group create --name TrainingRG --location centralindia
```

✓ 2. Create a Virtual Machine

```
az vm create --resource-group TrainingRG --name DemoVM --image UbuntuLTS
```

✓ 3. Check Cost Analysis

Portal → Cost Management → Cost Analysis

✓ 4. Apply RBAC

Portal → Resource Group → IAM → Add Role Assignment

FINAL SUMMARY — QUICK RECALL

Topic	Summary
Cloud	Renting IT infrastructure
Benefits	Scalable, secure, cost-effective
CAPEX/OPEX	Cloud shifts CAPEX → OPEX
Datacenters	Buildings with servers
Regions	Geographical group of datacenters
Region Pairs	Disaster recovery pairing
Cloud Models	Public, Private, Hybrid
Service Models	IaaS, PaaS, SaaS
Availability Zones	Physically separate datacenters
Resources	VM, DB, Storage
RG	Container for resources
ARM	Azure management engine
Azure Portal	Web UI
Cost mgmt	Monitor & control spending
Core Services	Compute, Storage, Network, DB
RBAC	Role-based access
Cloud Shell	Browser-based CLI
PowerShell/CLI	Command-line automation