

Introduction to Cloud Computing

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Prepared as concise, easy-to-read study notes

1. What Is Cloud Computing?

Definition	Key Idea
Delivery of computing services (servers, storage, databases, networking, software, analytics, AI, etc.) over the Internet “the cloud.”	Users access resources on-demand, pay only for what they use, and avoid managing physical hardware.

2. Core Characteristics (NIST Definition)

Characteristic	What It Means for Users
On-Demand Self-Service	Provision resources (e.g., VMs, storage) automatically via a portal or API without human interaction.
Broad Network Access	Services reachable from any device (laptop, phone, tablet) over standard networks (Internet, VPN).
Resource Pooling	Multi-tenant model – physical and virtual resources are shared among many customers, dynamically allocated.
Rapid Elasticity	Scale out/in quickly (seconds to minutes) to match workload spikes or drops.
Measured Service	Usage is monitored, reported, and billed (pay-as-you-go).

3. Service Models

Model	Description	Typical Use Cases
IaaS – Infrastructure as a Service	Provides virtualized compute, storage, networking. Users manage OS, middleware, runtime, data, applications.	Hosting websites, disaster recovery, big-data processing clusters.
PaaS – Platform as a Service	Supplies runtime environment, development tools, database services. Users focus on code and data.	Rapid app development, API services, CI/CD pipelines.

Introduction to Cloud Computing

Model	Description	Typical Use Cases
SaaS – Software as a Service	Fully managed applications delivered over the web. Users only interact with the UI.	Email (e.g., Gmail), CRM (Salesforce), collaboration (Office 365).
FaaS / Serverless (often considered a subset of PaaS)	Executes individual functions in response to events; no server management.	Event-driven processing, microservices, IoT data handling.

4. Deployment Models

Model	Ownership	Accessibility	Typical Scenarios
Public Cloud	Cloud provider owns & operates the infrastructure.	Available to anyone over the Internet (multi-tenant).	Startups, variable workloads, global reach.
Private Cloud	Dedicated to a single organization (on-premises or hosted).	Access limited to that organization (single-tenant).	Regulated industries, legacy migration, data sovereignty.
Hybrid Cloud	Combination of public & private clouds, linked by orchestration.	Workloads can move between environments.	Bursting to public cloud, separating sensitive data, phased migration.
Community Cloud	Shared by several organizations with common concerns (e.g., government, research).	Managed jointly or by a third party.	Collaborative projects, industry-specific compliance.

5. Major Cloud Providers (2024)

Provider	Core Offerings	Notable Services
Amazon Web Services (AWS)	IaaS, PaaS, SaaS, Serverless	EC2, S3, Lambda, RDS, SageMaker
Microsoft Azure	Integrated with Windows ecosystem	Virtual Machines, Azure Functions, Cosmos DB, Azure AI

Introduction to Cloud Computing

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Google Cloud Platform (GCP)	Data analytics & AI focus	Compute Engine, Cloud Storage, BigQuery, Cloud Run
IBM Cloud, **Oracle Cloud		