

Introduction to Cloud Computing

Introduction to Cloud Computing – Study Notes

1. What Is Cloud Computing?

Aspect	Definition
Core Idea	Delivery of computing resources (servers, storage, databases, networking, software, analytics, AI) over the Internet on a pay-as-you-go basis.
Key Benefits	• Elastic scaling • Cost efficiency • Rapid provisioning • Global accessibility • Reduced infrastructure management • Start-ups & SMEs
Typical Users	• Large enterprises • Developers & data scientists • End-users accessing SaaS apps

2. Service Models (The “X-as-a-Service” Stack)

Model	What It Provides	Typical Use Cases
IaaS – Infrastructure as a Service	Virtualized compute, storage, and networking (e.g., VMs, block storage, load balancers).	• Hosting websites • Disaster-recovery sites • Big-data processing clusters
PaaS – Platform as a Service	Managed runtime environments, development tools, databases, middleware.	• Application development & testing • API management • CI/CD pipelines

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Model	What It Provides	Typical Use Cases
SaaS – Software as a Service	Fully functional applications delivered via a browser or thin client.	• Email (e.g., Gmail) • CRM (e.g., Salesforce) • Collaboration suites (e.g., Office 365) • Event-driven data processing
FaaS – Function as a Service (Serverless)	Executes individual functions in response to events; no server management.	• Micro-service orchestration • Real-time image/video transformation

3. Deployment Models

Model	Description	When to Use
Public Cloud	Resources owned and operated by a third-party provider (AWS, Azure, Google Cloud).	• Variable workloads • Cost-sensitive projects
Private Cloud	Dedicated infrastructure for a single organization (on-premises or hosted).	• Strict compliance or data-sovereignty requirements
Hybrid Cloud	Combination of public and private clouds with orchestration between them.	• Burst workloads, legacy migration, disaster recovery
Multi-Cloud	Simultaneous use of services from two or more public providers.	• Avoid vendor lock-in, leverage best-of-breed services

4. Core Cloud Architecture Components

1. **Compute** – Virtual machines, containers, serverless functions.
2. **Storage** – Object (e.g., S3), block (e.g., EBS), file (e.g., Azure Files).
3. **Networking** – Virtual private clouds (VPC), load balancers, DNS, CDN.
4. **Databases** – Relational (RDS, Cloud SQL), NoSQL (DynamoDB, Cosmos DB), data warehouses (Redshift, BigQuery).
5. **Security & Identity** – IAM, encryption, security groups, firewalls, key management.
6. **Management & Monitoring** – Logging, metrics, alerting, cost-analysis dashboards.

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7. **DevOps Tools** – IaC (Terraform, CloudFormation), CI/CD pipelines, container orchestration (Kubernetes).
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5. Benefits & Challenges

Benefits

- **Scalability** – Automatic scaling up/down to match demand.
- **Cost Optimization** – Pay