**What Is Cloud Computing?**

Cloud computing is the delivery of computing services—servers, storage, databases, networking, software, analytics, and more—over the internet (“the cloud”) to offer faster innovation, flexible resources, and economies of scale. Instead of owning physical infrastructure, users rent access to services from a cloud provider.

**Types of Cloud Computing**

Cloud computing is categorized by **deployment models** and **service models**:

**Deployment Models**

|  |  |
| --- | --- |
| **Type** | **Description** |
| **Public Cloud** | Services offered over the internet by third-party providers (e.g., AWS, Azure, GCP) |
| **Private Cloud** | Cloud infrastructure operated solely for one organization |
| **Hybrid Cloud** | Combines public and private clouds for flexibility and control |
| **Community Cloud** | Shared infrastructure for a specific community with common concerns |

**Service Models**

|  |  |
| --- | --- |
| **Model** | **Description** |
| **IaaS** (Infrastructure as a Service) | Provides virtualized computing resources over the internet (e.g., AWS EC2) |
| **PaaS** (Platform as a Service) | Offers hardware and software tools for application development (e.g., Azure App Service) |
| **SaaS** (Software as a Service) | Delivers software applications over the internet (e.g., Google Workspace) |
| **FaaS** (Function as a Service) | Serverless computing where code runs in response to events (e.g., AWS Lambda) |

**Security Management in AWS**

AWS follows a **shared responsibility model**:

* **AWS’s responsibility**: Securing the infrastructure (hardware, software, networking, facilities)
* **Customer’s responsibility**: Securing data, applications, identity, and access management

**Key AWS Security Features**

* **IAM (Identity and Access Management)**: Controls user access
* **Encryption**: Data protection at rest and in transit
* **Security Groups & Firewalls**: Network-level protection
* **Monitoring & Logging**: Services like CloudTrail and GuardDuty for visibility
* **Compliance**: Meets standards like ISO, SOC, GDPR, HIPAA

**What Are Cloud Providers?**

Cloud providers are companies that offer cloud computing services. The top three are:

* **Amazon Web Services (AWS)**
* **Microsoft Azure**
* **Google Cloud Platform (GCP)**

**Comparison: AWS vs Azure vs GCP**

|  |  |  |  |
| --- | --- | --- | --- |
| **Feature** | **AWS** | **Azure** | **GCP** |
| **Launch Year** | 2006 | 2010 | 2008 |
| **Market Share** | ~33% | ~22% | ~11% |
| **Strengths** | Broadest service range | Integration with Microsoft | AI/ML and Big Data |
| **Compute Services** | EC2, Lambda | Virtual Machines | Compute Engine |
| **Storage Services** | S3, EBS | Blob Storage, Azure Files | Cloud Storage |
| **Security Tools** | IAM, Security Hub | Azure Security Center | Command Center |
| **Global Reach** | 33 regions, 105 zones | 60+ regions | 40 regions, 121 zones |
| **Pricing** | Flexible, pay-as-you-go | Competitive for hybrid setups | Cost-effective for analytics |

AWS leads in service breadth and maturity, Azure excels in hybrid cloud and enterprise integration, and GCP shines in data analytics and machine learning.