**Case Study: Amazon EC2 (Elastic Compute Cloud)**

**📌 Overview**

**Amazon EC2** is a core part of AWS (Amazon Web Services) that provides scalable virtual servers (instances) in the cloud. Users can launch and manage servers on-demand, which reduces the need for physical infrastructure.

**🔍 Key Features of Amazon EC2**

1. **Scalability**: Automatically scale capacity up or down using Auto Scaling and Elastic Load Balancing.
2. **Customizable Instances**: Choose from a wide variety of instance types optimized for compute, memory, or storage.
3. **Pay-as-you-go**: Charges are based on usage — per second or per hour.
4. **Secure**: Uses Amazon VPC (Virtual Private Cloud) and security groups for network and firewall management.
5. **Reliable**: EC2 runs in multiple Availability Zones for high availability and fault tolerance.

**⚙️ How EC2 Works (Architecture)**

1. **Launch**: A user launches an instance using a pre-configured Amazon Machine Image (AMI).
2. **Configure**: Choose instance type (e.g., t2.micro, m5.large), networking, and storage.
3. **Secure**: Attach security groups, key pairs (SSH), and IAM roles.
4. **Manage**: Use the EC2 Dashboard or AWS CLI/SDK to monitor, stop, restart, or terminate instances.

**🌐 EC2 Web Services Components**

| **Component** | **Description** |
| --- | --- |
| **AMI (Amazon Machine Image)** | Template for the root volume of an instance. Includes OS, app server, and apps. |
| **Instance Types** | Defines the hardware (CPU, RAM, etc.). E.g., t3.micro, c5.large. |
| **EBS (Elastic Block Store)** | Persistent storage volumes that can be attached to EC2. |
| **Security Groups** | Acts as a virtual firewall. Defines which traffic is allowed. |
| **Elastic IPs** | Static IP addresses for dynamic cloud computing. |
| **Auto Scaling** | Automatically adjusts the number of EC2 instances. |
| **Load Balancer** | Distributes traffic across multiple instances. |

**🏢 Real-World Use Case: Netflix**

**Netflix** uses EC2 to:

* Run its video streaming platform with high scalability.
* Handle unpredictable workloads by dynamically scaling instances.
* Achieve fault tolerance across global AWS regions.

**✅ Benefits**

* **Elasticity**: Quickly adapt to changing workloads.
* **Speed**: Deploy new instances in minutes.
* **Cost-effective**: Choose reserved, spot, or on-demand pricing.