LAB ASSIGNMENT 1: CASE STUDY OF AMAZON EC2

1. What are the key components of Amazon EC2, and how do they work together?

Answer:
Amazon EC2 (Elastic Compute Cloud) provides scalable compute capacity in the cloud. Key components include:

- **Instances** – Virtual machines running on EC2.
- **Amazon Machine Images (AMI)** – Pre-configured templates used to launch instances.
- **Instance Types** – Different configurations of CPU, memory, and networking capacity.
- **Elastic Block Store (EBS)** – Persistent storage volumes for EC2 instances.
- **Security Groups** – Firewalls that control inbound and outbound traffic.
- **Elastic Load Balancer (ELB)** – Distributes traffic across multiple instances.
- **Auto Scaling** – Automatically adjusts the number of instances based on demand.

These components work together to provide a **scalable, flexible, and secure cloud computing environment**.

2. How does AWS EC2 Auto Scaling work, and why is it important?

Answer:
AWS **Auto Scaling** automatically adjusts the number of EC2 instances to handle workload fluctuations. It works by:

1. Defining **Scaling Policies** – Increase or decrease instances based on CPU usage, network traffic, or other metrics.
2. Using **Launch Templates** – Configurations for new instances (AMI, instance type, security groups).
3. Integrating with **Elastic Load Balancer (ELB)** – Distributes traffic across instances for high availability.
4. **Monitoring with CloudWatch** – Triggers scaling actions based on performance metrics.

Auto Scaling is important because it:

- Ensures **high availability** by adding instances when demand increases.
- Optimizes **costs** by reducing instances during low usage periods.
- Improves **application performance** by dynamically adjusting resources.

3. What are the differences between On-Demand, Reserved, and Spot EC2 instances?

Answer:

Instance Type	Description	Best Use Cases
On-Demand	Pay for compute capacity by the hour/second. No long-term commitment.	Short-term, unpredictable workloads. Development & testing.
Reserved	Commit to using instances for 1 or 3 years for discounted pricing.	Steady, predictable workloads. Cost-sensitive applications.
Spot	Bid for unused AWS capacity at significantly lower prices.	Fault-tolerant, batch jobs, big data processing.

Each type provides **flexibility, cost-efficiency, and scalability** based on business needs.

4. How does AWS ensure high availability and fault tolerance in EC2 deployments?

Answer:
AWS ensures **high availability and fault tolerance** through:

1. **Multiple Availability Zones (AZs):**
   - EC2 instances can be deployed across different AZs to prevent failures.
2. **Elastic Load Balancing (ELB):**
   - Automatically distributes traffic between healthy instances.
3. **Auto Scaling Groups:**
   - Automatically adds or removes instances based on demand.
4. **Amazon Elastic Block Store (EBS) Snapshots:**
   - Enables regular backups for disaster recovery.
5. **Amazon CloudWatch Monitoring:**
   - Detects performance issues and triggers alerts.
6. **AWS Global Infrastructure:**
   - Ensures redundancy with multiple data centers worldwide.

5. What security measures should be implemented for an EC2 instance?

Answer:
To secure an EC2 instance, follow these best practices:

1. **Use IAM Roles:**
    - Assign least privilege permissions instead of using root credentials.
2. **Configure Security Groups & Network ACLs:**
    - Restrict inbound and outbound traffic based on need.
3. **Enable Encryption:**
    - Encrypt EBS volumes and S3 data.
4. **Implement Key Pair Authentication:**
    - Use SSH key pairs for secure access.
5. **Regularly Update Software & Patch Vulnerabilities:**
    - Keep OS and applications up to date.
6. **Enable AWS GuardDuty & AWS WAF:**
    - Detect and prevent threats like DDoS attacks.
7. **Set Up CloudWatch & CloudTrail Logs:**
    - Monitor activity and identify suspicious behavior.