AWS Core Services — Detailed Overview

1. Amazon EC2 (Elastic Compute Cloud)

- Overview

- Amazon EC2 provides scalable virtual servers (instances) in the cloud.

- It allows users to run applications, host websites, or process large-scale computations.

- Offers on-demand compute capacity, so you only pay for what you use.

- Key Features

- Elasticity: Quickly scale up or down based on demand.

- Variety of Instance Types optimized for compute, memory, or storage.

- Customizable AMIs and Auto Scaling capabilities.

- Security Groups and Load Balancing for traffic control.

- Use Cases

- Web Hosting, Machine Learning, Data Processing, and CI/CD Pipelines.

- Example

aws ec2 run-instances --image-id ami-0abcdef1234567890 --count 1 --instance-type t2.micro --key-name MyKeyPair

2. Amazon VPC (Virtual Private Cloud)

- Overview

- VPC allows creation of an isolated network within AWS with full control over IP ranges, subnets, and routing.

- Key Components

- Subnets, Route Tables, Internet Gateway, NAT Gateway, Security Groups, and Network ACLs.

- Use Cases

- Hosting secure applications, connecting on-premises networks, and multi-tier architectures.

- Example

aws ec2 create-vpc --cidr-block 10.0.0.0/16

3. AWS IAM (Identity and Access Management)

- Overview

- IAM controls access to AWS services and resources securely using users, roles, and policies.

- Key Features

- Users, Groups, Roles, Policies, MFA, and Federated Access.

- Use Cases

- Secure access, cross-account roles, and temporary credentials for applications.

- Example Policy

```
{
 "Version": "2012-10-17",
 "Statement": [
  {
   "Effect": "Allow",
   "Action": "ec2:Describe*",
   "Resource": "*"
  }
 ]
}
```

4. Amazon RDS (Relational Database Service)

- Overview

- Managed database service for MySQL, PostgreSQL, Oracle, SQL Server, and Aurora.

- Key Features

- Automated Backups, Multi-AZ, Read Replicas, Auto Scaling, and Encryption.

- Use Cases

- Transactional systems, data warehousing, and disaster recovery.

- Example

aws rds create-db-instance --db-instance-identifier mydb --db-instance-class db.t3.micro --engine mysql --allocated-storage 20 --master-username admin --master-user-password password123

5. Amazon EBS (Elastic Block Store)

- Overview

- Provides persistent block storage for EC2 instances, functioning like a virtual hard drive.

- Key Features

- Durable, Scalable, Performance options (SSD/HDD), Snapshots, and Encryption.

- Use Cases

- Database storage, boot volumes, and backups.

- Example

aws ec2 create-volume --size 8 --availability-zone us-east-1a

Integration Example — Combined Use Case

- EC2 runs the web server.

- VPC provides network isolation.

- IAM secures resource access.

- RDS hosts the database.

- EBS provides persistent storage.

- Architecture Summary

[User] → [Internet Gateway] → [EC2 (Web Server)] → [RDS Database] → [EBS Volume]

Conclusion

- EC2 → Scalable compute power

- VPC → Secure network isolation

- IAM → Access control

- RDS → Managed relational database

- EBS → Persistent block storage