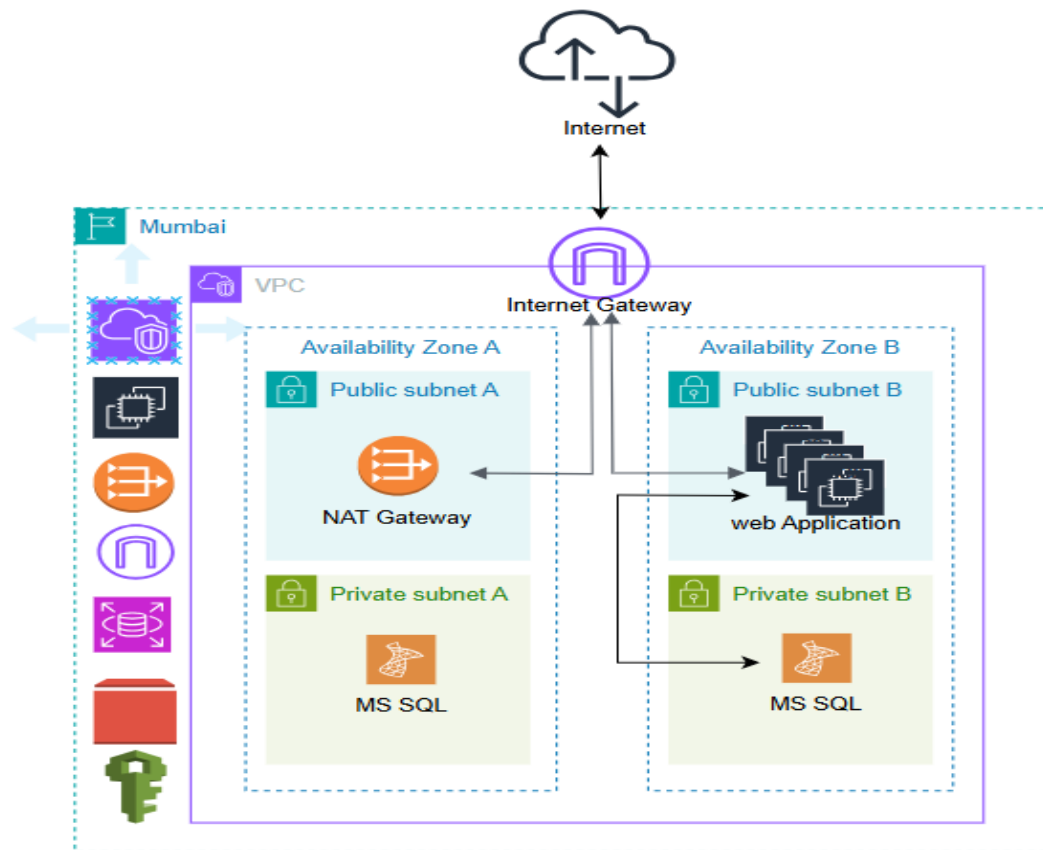1. **Scenario-Based Questions (VPC, IAM, EC2, EBS, Routing, Security Group, Internet Gateway, NAT Gateway)**

LAB 1:

Step1- Create VPC, Subnetting, Routing

Step2- Launch EC2 in the public subnet

Step3- Launch RDS in the private subnet

Step4- Create IAM users with setup permission to access the resource

Step5- Verify and Test the connectivity of DB and Application from outside VPC and Inside the VPC

1. **EC2 and EBS**

   o   Your EC2 instance becomes unresponsive. How do you troubleshoot and recover the instance without losing data?

   o   How would you resize an EBS volume attached to a running EC2 instance to accommodate increased storage requirements?

   o   Describe a use case for creating and using EBS snapshots in an environment with frequent database changes.

2. **VPC and Routing**

   o   You have to deploy an application in a private subnet, and the application needs access to the internet to download updates. How would you design the networking for this use case?

   o   Explain how to configure routing between two VPCs in different AWS regions.

3. **Internet Gateway and NAT Gateway**

   o   What steps would you take to ensure instances in a private subnet can connect to the internet but do not allow inbound internet traffic?

   o   An application in the private subnet can't access the internet after setting up a NAT Gateway. How would you troubleshoot the issue?

4. **Security Groups**

   o   An EC2 instance in a public subnet is not accessible from your on-premises environment. How would you resolve this while ensuring minimal exposure?

   o   How would you design security groups to allow only a specific set of IPs to access a set of EC2 instances hosting a web application?

5. **Combined Use Cases**

   o   You are tasked with migrating a multi-tier web application to AWS. Explain how you would design the VPC, subnets, routing, and security groups to ensure the application is secure and scalable.

   o   A compliance requirement mandates that specific application traffic must be routed through an on-premises data center. How would you configure this using a combination of AWS services?

Real-Time Use Cases

1. **Setting Up a Secure Application Architecture**

   o   Deploy a three-tier architecture with a public subnet for the web servers, private subnets for the application servers, and a database. Configure routing and security groups to restrict access to the database tier.

2. **High Availability with EC2 and NAT Gateway**

   o Design a highly available application across multiple Availability Zones with private subnets. Use NAT Gateways in each AZ to ensure redundancy and failover.

3. **Data Backup and Disaster Recovery**

   o Use EBS snapshots to back up critical application data. Implement an automated lifecycle policy to retain snapshots for a defined period.

4. **Hybrid Cloud with VPC Peering**

   o Connect an on-premises data center to an AWS VPC using a VPN or Direct Connect. Design routing to allow seamless access to AWS-hosted applications.

5. **Optimizing Internet Access**

   o Configure an Internet Gateway for public-facing applications while ensuring internal applications access the internet via a NAT Gateway in a cost-effective way.

6. **Secure Multi-Account Setup**

   o Implement a hub-and-spoke VPC design where the central VPC hosts shared services, and other VPCs connect to it through VPC Peering or Transit Gateway.

7. **Load Balancing and Auto Scaling**

   o Deploy an auto-scaling group in multiple AZs. Configure security groups to allow traffic from a Load Balancer and ensure routing is set for efficient traffic distribution.

Troubleshooting Scenarios

1. **EC2 Connectivity Issues**

   o An EC2 instance is inaccessible. Explain how you would check security groups, route tables, and Network ACLs to identify the problem.

2. **EBS Performance**

   o An application running on an EC2 instance is experiencing degraded performance due to EBS latency. What steps would you take to resolve this issue?

3. **VPC Routing Conflicts**

   o Two VPCs connected via VPC Peering can't communicate. What would you check in the route tables and CIDR block configuration?

4. **NAT Gateway Cost Optimization**

   o A client complains about high NAT Gateway costs. What optimizations would you suggest?

5. **Unintentional Public Exposure**

   o An EC2 instance in a private subnet is accidentally accessible from the internet. How would you identify and fix the configuration error?

Interview Challenges

- Design a fully secure and scalable VPC architecture for a SaaS application.

- Implement a centralized logging solution for EC2 instances using Security Groups, VPC Flow Logs, and CloudWatch.

- Configure a CI/CD pipeline where EC2 instances in private subnets automatically download build artifacts from S3.