Day 12

“CLOUD SECURITY”

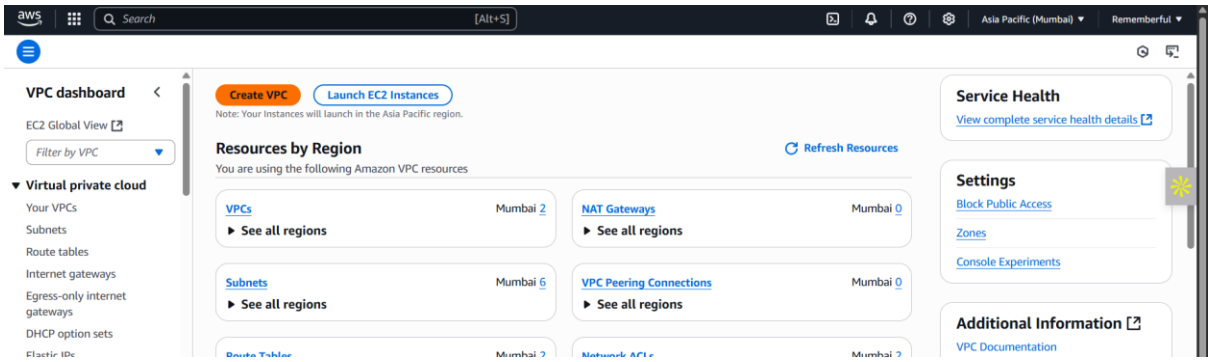
Utilizing Separate VPCs to Isolate Infrastructure

1. **Purpose & Benefits**
    - Amazon VPC provides logically isolated virtual networks within AWS to separate workloads or organizational units.
    - Enhances security, network control, and resource management in the public cloud.
2. **Isolation & Configuration**
    - Use subnets to separate application tiers (e.g., web, app, DB).
    - Private subnets prevent direct internet access to sensitive instances.
    - Administrators control IP ranges, DHCP, routing, and access policies.
3. **Security Features**
    - Security Groups (SGs): Act as virtual firewalls to control traffic to/from instances.
    - Access Control Lists (ACLs): Define specific IPs or applications allowed to access the VPC.
    - Prevents DDoS and unauthorized access by isolating instances from public exposure.
4. **Result**
    - Ensures granular access control, layer-3 Internet isolation, and multi-tenant data separation in AWS.

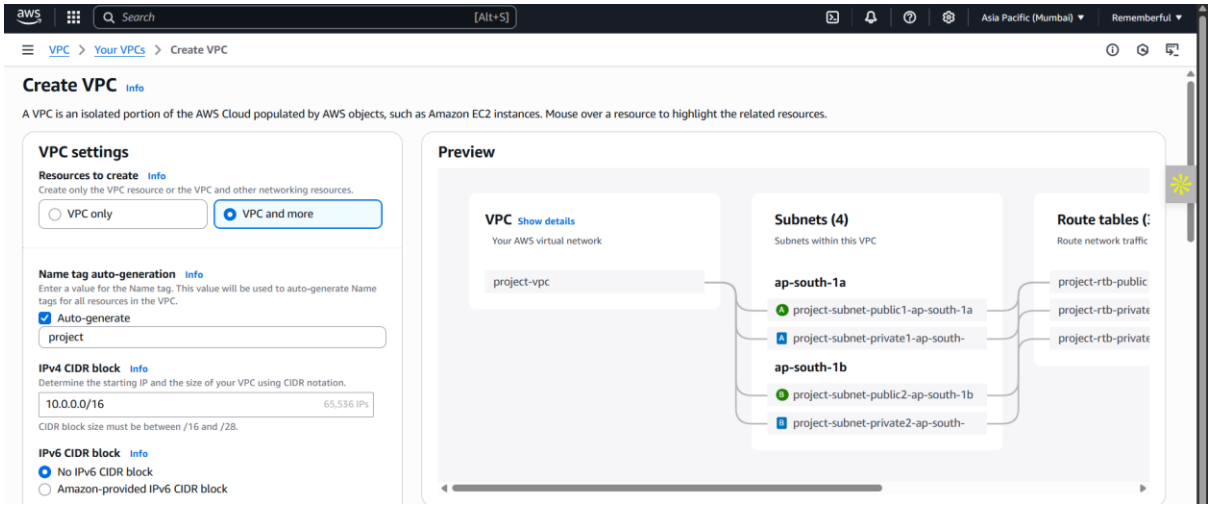
Creating a VPC:

Steps:

Open the AWS, and enter VPC in the search bar, and press enter. Following Screen will appear:



Click on the “Create VPC” button: following screen will appear



Specify the details and then click on the “create VPC” button at the bottom.

<u>Best practices for creating a secure and well-architected VPC in AWS:</u>

1. **VPC Design**
    - Choose a non-overlapping CIDR block (e.g., 10.0.0.0/16).
    - Create separate public and private subnets.
    - Use multiple Availability Zones (AZs) for high availability.
    - Isolate application tiers (web, app, DB) using subnets.
2. **Security Best Practices**
    - Use Security Groups (SGs):
        - Allow only required ports/IPs.
        - Avoid 0.0.0.0/0 unless strictly necessary.
    - Use Network ACLs (NACLs) for subnet-level filtering.
    - Enable VPC Flow Logs for traffic monitoring and auditing.
3. **Internet & Routing**
    - Attach an Internet Gateway (IGW) to VPC for internet access.
    - Use NAT Gateway or NAT instance for secure internet access from private subnets.
    - Configure Route Tables correctly for each subnet.
4. **Private Connectivity**
    - Use VPC Endpoints (Interface/Gateway) for private AWS service access.
    - Use AWS PrivateLink for secure private connectivity to third-party services.
5. **Network Management**
    - Enable DNS resolution and hostnames.
    - Use DHCP options set for custom domain names.
    - Use Tags for organizing and managing resources.
6. **Access & Control**
    - Use Bastion Host (Jump Box) for SSH access to private instances.
    - Enforce IAM roles and policies for least-privilege access.
    - Use multi-factor authentication (MFA) for management access.
7. **Monitoring & Compliance**

- Enable AWS CloudTrail to log all API actions.
- Use AWS Config for continuous compliance checks.
- Enable Amazon GuardDuty for threat detection.

8. **Encryption**
    - Use AWS KMS for encrypting data at rest (EBS, S3).
    - Enforce TLS for data in transit.
9. **High Availability**
    - Deploy resources across multiple AZs.
    - Use Elastic Load Balancing for distributing traffic.
    - Set up Auto Scaling for resilience.