

# 1. Introduction

- **Purpose:** The purpose of this guide is to provide a comprehensive implementation and configuration guide for the Capstone Project, detailing the steps necessary to set up the architecture, deploy applications, and ensure security and monitoring.
- **Scope:** The guide focuses on the implementation of AWS services including VPC, EC2, EFS, and Load Balancers, as well as the configuration of security groups, monitoring, and backup strategies.

## 2. Deployment Strategy

- **High-Level Architecture:** The architecture includes a Virtual Private Cloud (VPC) with public and private subnets, Elastic Compute Cloud (EC2) instances for application hosting, Elastic File System (EFS) for storage, and an Application Load Balancer (ALB) for traffic distribution.
- **Key Components:**
  - **VPC:** Provides a secure network environment.
  - **EC2:** Hosts the web application.
  - **ALB:** Distributes incoming traffic across multiple EC2 instances.
  - **EFS:** Provides scalable file storage for the application.

## 3. Challenges Encountered

- **Configuration Complexities:** Setting up the VPC and ensuring proper routing and security group configurations was complex.
- **Integration Problems:** Ensuring that all components (EC2, EFS, ALB) worked seamlessly together posed challenges.
- **Scalability Issues:** Initial configurations did not adequately handle traffic spikes.
- **High Availability Considerations:** Ensuring high availability across multiple Availability Zones (AZs) was critical but complex.

## 4. Solutions Implemented

- **Troubleshooting Methods:** A systematic approach was taken to identify and resolve issues, including reviewing configurations and logs.

- **Implemented Solutions:**
  - Adjusted Auto Scaling settings to better handle traffic spikes.
  - Modified VPC configurations to improve routing and security.
  - Updated security group rules to allow necessary traffic while maintaining security.

## 5. Results and Performance Metrics

Data collected from monitoring tools like AWS CloudWatch showed significant improvements in application performance. Before adjustments, the application struggled under load, but after implementing Auto Scaling and optimizing configurations, response times improved, and the application could handle increased traffic. Graphs and charts illustrate these performance gains, highlighting reduced latency and increased throughput.

## 6. Lessons Learned and Best Practices

- **What Worked Well:** The use of Auto Scaling effectively managed load variations, and the architecture provided resilience.
- **Areas for Improvement:** More thorough testing of configurations before deployment could prevent some issues.
- **AWS-Specific Insights:** Cost optimization techniques, such as using reserved instances, and performance tuning through monitoring were crucial for maintaining efficiency.

## 7. Conclusion

The deployment strategy significantly impacted the project goals, achieving both scalability and resilience. Continuous monitoring and optimization are essential for maintaining performance and adapting to changing demands.

## 8. Q&A

1. **Question:** What should I do if I am unable to configure the Security Group for all Security Groups (SG)?

**Answer:** If you are unable to configure the Security Group, ensure that you remove the old configuration completely before adding the new configured rules.

2. **Question:** Why is my HTTPD server not starting automatically after stopping the instance?

**Answer:** After installing the HTTPD server, it is essential to start and enable the httpd service. If you do not enable it, the httpd service will stop automatically when the instance is stopped, making the webpage inaccessible.

3. **Question:** What should I check if I encounter issues with the Elastic File System (EFS) configuration?

**Answer:** Ensure that the EFS settings are configured appropriately. Specifically, make sure to mention the correct mount point as /var/www/html by replacing the default efs directory in the configuration.

4. **Question:** What happens if I terminate an instance in the Auto Scaling Group (ASG)?

**Answer:** If you terminate an instance in the ASG, the system will automatically create a new instance to maintain the desired capacity. You can monitor this process in the ASG dashboard under the Activity section.

5. **Question:** How can I verify that my load balancing is functioning correctly?

**Answer:** To verify load balancing, refresh the page of your Web-app and Test-app. You should see the IPs of the instances fluctuating, indicating that the load is being balanced between both servers.

## 9. References

AWS Official Documentation: <https://docs.aws.amazon.com/>