**Group 3:** Lakshmi M, Sahar M, Pouria M, Manjinder S, Alireza O, Alireza T, Parsa N, Suteash S, Toby H, Tony T

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John Ali

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**Deployment and Optimization of a Secure AWS Web Server with On-Prem Integration via Site-to-Site VPN and Cost Estimation Using AWS Calculator**

# Proposal for TTI

In Group 3, we are proposing the establishment of a site-to-site VPN connection between our AWS cloud infrastructure and the on-premises data center at our Vancouver site. This connection will allow for secure, encrypted communication between both environments, ensuring that data and application traffic can flow seamlessly and securely between the cloud and the on-prem system. The core of the project will involve deploying a web server hosted on an EC2 instance in AWS. This EC2 instance will be part of a custom Virtual Private Cloud (VPC), specifically designed for this hybrid cloud architecture, which ensures that the deployed resources remain secure and highly available. We will configure the VPC with public and private subnets, segregating sensitive resources to ensure that only authorized traffic can access certain components of the architecture. Elastic Load Balancing (ELB) will be employed to distribute incoming traffic across multiple EC2 instances deployed in different availability zones, ensuring high availability and reliability of the web server even during failures of individual components or infrastructure. Additionally, AWS's auto-scaling capabilities will be leveraged to dynamically adjust the number of running instances based on demand, further enhancing the scalability of the system. The entire infrastructure will be secured using best practices in AWS security. Specifically, we will configure custom security groups that define fine-grained rules for the inbound and outbound traffic to/from the EC2 instances, network ACLs to manage traffic at the subnet level, and IAM roles that control which users or services can access specific resources. The implementation of these security measures will ensure that the infrastructure is protected against unauthorized access, data breaches, and potential cyber threats. To further secure the connection between the AWS environment and the on-prem data center, the site-to-site VPN connection will be encrypted using IPSec protocols, ensuring data confidentiality and integrity during transmission. This secure communication channel will also allow for direct integration between on-prem services and the cloud-hosted web server, providing a hybrid solution that combines the benefits of cloud scalability with the control and legacy systems hosted on-premises. As part of the project, we will also implement a disaster recovery strategy that will ensure business continuity in the event of failure. By leveraging AWS EC2 Auto Recovery to automatically recover instances in case of failures, we can maintain service uptime and data integrity. Furthermore, AWS's CloudWatch monitoring service will be employed to keep track of the system’s health and performance, allowing us to proactively address potential issues before they cause disruptions to the business. The project will also involve extensive cost analysis using the AWS Cost Calculator, which will estimate the costs associated with running this hybrid infrastructure. The calculator will take into account factors such as EC2 instance pricing, data transfer costs between AWS and the on-prem data center, storage requirements, and VPN connection fees. This will allow us to optimize the solution for cost-effectiveness by selecting the most appropriate EC2 instance types, minimizing data transfer costs, and adjusting the architecture to avoid unnecessary expenditures. Additionally, we will analyze the potential for cost savings through reserved instances or savings plans offered by AWS, which provide significant discounts in exchange for committing to long-term usage. The use of the AWS Cost Calculator will be pivotal in ensuring that the infrastructure remains financially sustainable, especially for small to medium-sized businesses that must carefully manage their budgets while scaling their operations. The integration of on-prem infrastructure with AWS cloud services offers significant advantages for businesses that wish to extend the life of their existing hardware and resources, while also taking advantage of cloud computing's elasticity and flexibility. By maintaining critical on-prem systems and simultaneously leveraging the cloud for scalability, businesses can achieve a best-of-both-worlds scenario. For example, sensitive data that requires compliance with specific regulatory standards might remain securely on-prem, while less critical applications can be hosted on AWS to benefit from its high availability and performance. This hybrid approach will allow organizations to better meet the unique needs of their operations, whether it be cost savings, security, or performance. Moreover, the project will focus on achieving a cost-effective solution by optimizing infrastructure usage based on anticipated demand. The AWS Cost Calculator will help simulate different usage scenarios, such as varying levels of web traffic, data storage, and compute requirements, and will recommend configurations that balance cost-efficiency with performance. For instance, by determining peak traffic times, we can adjust the size of EC2 instances or increase auto-scaling capacity during high-traffic periods while reducing resources during periods of low demand. Additionally, implementing spot instances for non-critical workloads could further reduce costs, as these instances offer significant savings over on-demand instances. This type of cost optimization is essential for smaller organizations that may not have the budget to support enterprise-level cloud infrastructure but still require the flexibility to scale as their needs grow. The final solution will be tested rigorously to ensure that all components work together as expected. This will include verifying the functionality of the VPN connection, ensuring that traffic flows securely between the on-prem data center and AWS, testing the load balancing mechanisms to ensure that traffic is correctly distributed, and validating that the auto-scaling feature responds appropriately to changes in traffic. Performance testing will also be performed to ensure that the web server hosted on AWS meets the required latency and throughput standards. Once the solution is operational, we will document the entire deployment process, including network architecture diagrams, security configurations, and cost estimates, providing a comprehensive report that outlines how the hybrid architecture was implemented and optimized. This report will serve as a guide for other businesses looking to adopt similar hybrid cloud solutions. In conclusion, Group 3 proposes a project that aims to demonstrate the power and flexibility of AWS Cloud Services while ensuring security, high availability, and cost-effectiveness. By integrating on-prem systems with cloud-hosted resources and using the AWS Cost Calculator to optimize costs, we will provide a robust, scalable, and financially viable solution for SMEs seeking to modernize their IT infrastructure while maintaining the integrity of their existing systems. With a well-planned disaster-recovery strategy and continuous performance monitoring, this solution will provide businesses with the tools they need to ensure long-term success and sustainability in a competitive digital landscape.

# Design for Project

