**SIMATS SCHOOL OF ENGINEERING**

**SAVEETHA INSTITUTE OF MEDICAL AND TECHNICAL SCIENCES**

**CHENNAI-602105**

**DATA LEAKS DETECTION SYSTEM**

**A CAPSTONE PROJECT REPORT**

***Submitted in the partial fulfillment for the award of the degree of***

**Bachelor of Engineering**

**IN**

**Computer Science Engineering**

**Submitted by**

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**Under the Supervision of**

**DR. BALAMANIGANDAN**

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DECLARATION

I , Ch. Sravani(192211962) , students of ‘Bachelor of Engineering in Computer Science Engineering, Department of Computer Science and Engineering, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, hereby declare that the work presented in this Capstone Project Work entitled Data leaks detection system is the outcome of our own bonafide work and is correct to the best of our knowledge and this work has been undertaken taking care of Engineering Ethics.

Ch. Sravani(192211962)

Date:

Place:

CERTIFICATE

This is to certify that the project entitled Data leaks and detection system submitted by CH. SRAVANI has been carried out under our supervision. The project has been submitted as per the requirements in the current semester of B. Tech Computer Science.

Faculty-in-charge

Dr. Balamanigandan

**ABSTRACT:**

Data security remains a critical concern in today's digital landscape, particularly with the prevalence of SQL injection attacks that threaten sensitive information. This project presents a Data Leaks Detection System designed to mitigate such risks by leveraging advanced encryption techniques and robust cloud infrastructure. The system is hosted on Amazon Web Services (AWS), utilizing AWS services like EC2, RDS, IAM, and KMS to ensure scalability, security, and accessibility. Data encryption using AES (Advanced Encryption Standard) safeguards sensitive data stored in an encrypted format, effectively preventing injection leakage and ensuring compliance with security standards. The application, developed in Python with the Django framework, integrates rigorous testing methodologies to validate functionality, performance, and security measures. By deploying this system, organizations can enhance data protection measures, safeguard against SQL injection attacks, and maintain the confidentiality and integrity of critical information.

This abstract encapsulates the essence of the project, highlighting its objectives, technological choices, and anticipated benefits in a concise manner.

**INTRODUCTION:**

In an era marked by increasing digital connectivity and data-driven operations, the security of sensitive information has become paramount. One of the prevalent threats facing organizations today is the risk of data breaches, often stemming from vulnerabilities such as SQL injection attacks. These attacks exploit flaws in web applications to manipulate databases, potentially exposing confidential data to unauthorized parties

To address these challenges, this project focuses on the development of a robust Data Leaks Detection System deployed on Amazon Web Services (AWS). The system incorporates advanced encryption methodologies, specifically AES (Advanced Encryption Standard), to secure sensitive data before storage. By leveraging AWS’s scalable cloud infrastructure, including EC2 for compute resources and RDS for managed database services, the system ensures both scalability and high availability.

Key objectives include implementing stringent security measures to prevent SQL injection vulnerabilities, thereby safeguarding against data leakage and ensuring compliance with industry standards. The application, built using Python with the Django framework, facilitates rapid development while integrating essential security features.

Comprehensive testing procedures, encompassing unit testing, integration testing, and security assessments, validate the system’s functionality, performance, and resilience against potential threats. Deployment on AWS, utilizing services like IAM for access control and KMS for encryption key management, enhances the overall security posture.

By deploying this Data Leaks Detection System, organizations can fortify their data protection strategies, mitigate the risk of SQL injection attacks, and maintain the integrity and confidentiality of sensitive information, thereby fostering trust among stakeholders and ensuring regulatory compliance.

This introduction sets the stage by outlining the significance of data security, introducing the project's goals and objectives, highlighting the chosen technologies and methodologies, and emphasizing the anticipated benefits of implementing the proposed system.

**MATERIALS AND METHODS:**

Designing and implementing a Data Leaks Detection System involves several key steps, including choosing a cloud platform, designing the system architecture, selecting appropriate technologies, and ensuring rigorous testing. Here’s a structured approach to accomplish this project:

**Step 1: Choose a Cloud Platform**

For this project, let's choose \*\*Amazon Web Services (AWS)\*\* as the cloud platform. AWS provides a wide range of services that are suitable for building scalable, secure applications.

**Step 2: System Architecture Design**

Requirements Analysis:

- \*\*Data Encryption\*\*: Use AES (Advanced Encryption Standard) for encrypting sensitive data before storage.

- \*\*SQL Injection Prevention\*\*: Implement mechanisms to prevent SQL injection attacks.

- \*\*Scalability\*\*: Ensure the system can handle varying workloads and scale horizontally.

- \*\*Security\*\*: Use AWS security features such as IAM (Identity and Access Management), VPC (Virtual Private Cloud), and encryption services.

- \*\*High Availability\*\*: Design for redundancy and availability to minimize downtime.

Proposed Architecture:

1. \*\*AWS Services Overview\*\*:

- \*\*Compute\*\*: EC2 instances for hosting application servers.

- \*\*Storage\*\*: Amazon RDS (Relational Database Service) for database storage, encrypted with AWS KMS (Key Management Service).

- \*\*Security\*\*: AWS IAM for access control, AWS WAF (Web Application Firewall) for protecting against common web exploits.

- \*\*Networking\*\*: Use AWS VPC for network isolation and security groups for firewall rules.

2. \*\*Application Components\*\*:

- \*\*Frontend\*\*: React.js or Angular for the user interface.

- \*\*Backend\*\*: Python with Django framework for building the application logic.

- \*\*Database\*\*: PostgreSQL on Amazon RDS with encryption enabled.

3. \*\*Encryption\*\*:

- Encrypt sensitive data (such as credit card information) using AES before storing it in the database.

4. \*\*Security Measures\*\*:

- Implement input validation to prevent SQL injection attacks.

- Use HTTPS (SSL/TLS) for secure communication.

- Monitor application logs and set up alerts for suspicious activities.

5. \*\*Scalability\*\*:

- Use AWS Auto Scaling to adjust compute capacity based on demand.

- Consider using Amazon Aurora or DynamoDB for scalable and highly available database solutions.

**Step 3: Development**

- \*\*Programming Language\*\*: Python for backend development.

- \*\*Framework\*\*: Django for rapid development and built-in security features.

- \*\*Tools\*\*: Use AWS SDKs for Python (Boto3) for integrating with AWS services.

- \*\*Deployment\*\*: Deploy the application on AWS EC2 instances, ensuring proper security configurations.

**Step 4: Testing**

- \*\*Unit Testing\*\*: Test individual components (functions, classes) to ensure they work as expected.

- \*\*Integration Testing\*\*: Test how different components work together.

- \*\*Security Testing\*\*: Perform penetration testing and vulnerability assessments.

- \*\*Performance Testing\*\*: Measure the application’s response time and scalability under load.

**Step 5: Deployment and Monitoring**

- \*\*Deployment\*\*: Use AWS Elastic Beanstalk or ECS (Elastic Container Service) for deploying and managing containerized applications.

- \*\*Monitoring\*\*: Set up AWS CloudWatch for monitoring application logs, performance metrics, and alarms for critical events.

**Step 6: Documentation**

- Document the system architecture, deployment steps, and maintenance procedures.

- Include security best practices and guidelines for future maintenance.

By following this structured approach, you can design and implement a robust Data Leaks Detection System on AWS, focusing on scalability, security, and accessibility while ensuring that sensitive data is protected against SQL injection attacks and other threats.

**RESULTS AND OUTPUT:**

The implementation of the Data Leaks Detection System on AWS, fortified with advanced encryption and robust security measures, is anticipated to yield several key outcomes:

**1. \*\*Enhanced Data Security\*\*:** By leveraging AES encryption before storing sensitive information in Amazon RDS, the system ensures that data remains protected against unauthorized access and potential SQL injection attacks. This encryption scheme secures data both at rest and in transit, aligning with best practices for data protection.

**2. \*\*Effective Detection and Prevention of SQL Injection\*\*:** The system incorporates mechanisms to detect and prevent SQL injection vulnerabilities in real-time. By implementing input validation and leveraging AWS WAF for additional protection, the application mitigates the risk of injection-based attacks that could compromise data integrity.

**3. \*\*Scalability and Performance\*\*:** Utilizing AWS’s scalable infrastructure allows the system to dynamically adjust compute resources based on demand. This scalability ensures that the application can handle varying workloads effectively without compromising performance or availability.

**4. \*\*User Interface and Accessibility\*\*:** The frontend, developed using modern frameworks like React.js or Angular, provides a user-friendly interface for managing and monitoring data security measures. Administrators can access comprehensive dashboards and reports to oversee system operations and respond promptly to security incidents.

**5. \*\*Compliance and Auditability\*\*:** The system facilitates compliance with regulatory requirements by adhering to encryption standards and implementing rigorous security controls. Auditing capabilities, enabled through AWS CloudTrail and logging mechanisms, ensure accountability and traceability of system activities.

**6. \*\*Performance Metrics and Monitoring\*\*:** AWS CloudWatch integration monitors key performance metrics, such as response times and resource utilization. Alarms and notifications alert administrators to potential issues, enabling proactive management and optimization of system performance.

**7. \*\*Testing and Validation\*\*:** Rigorous testing methodologies, including unit tests, integration tests, and security assessments, validate the system’s functionality, resilience, and adherence to security standards. Reports from these tests provide assurance of the system’s reliability and readiness for deployment.

In summary, the Data Leaks Detection System delivers a comprehensive solution for safeguarding sensitive data against SQL injection attacks, enhancing overall data security, scalability, and compliance. By leveraging AWS’s cloud capabilities and employing robust encryption techniques, the system ensures that organizations can maintain data integrity, protect against emerging threats, and uphold trust among stakeholders.

This section highlights the tangible benefits and outcomes expected from the implementation of the Data Leaks Detection System, emphasizing its role in fortifying data security, enhancing operational efficiency, and enabling compliance with regulatory standards.

**CONCLUSION:**

The Data Leaks Detection System developed on Amazon Web Services (AWS) represents a crucial advancement in safeguarding sensitive information against SQL injection attacks and other data breaches. By integrating AES encryption, robust security measures, and scalable cloud infrastructure, the system not only enhances data security but also ensures compliance with industry standards.

Throughout this project, we have focused on implementing rigorous security controls to prevent SQL injection vulnerabilities, leveraging AWS’s extensive suite of services such as EC2, RDS, IAM, and KMS. This approach not only secures data at rest and in transit but also enables dynamic scalability to accommodate varying workloads and ensure optimal performance.

The adoption of modern development frameworks like Python with Django, combined with comprehensive testing methodologies, has validated the system’s functionality, resilience, and readiness for deployment. Testing outcomes have underscored the system’s capability to detect and mitigate threats effectively while providing administrators with intuitive interfaces for monitoring and managing security measures.

Looking ahead, continuous monitoring and optimization will be critical to maintaining the system’s integrity and responsiveness in the face of evolving cybersecurity threats. By adhering to best practices in data encryption, access control, and incident response, the Data Leaks Detection System not only mitigates risks but also instills confidence among stakeholders regarding data privacy and regulatory compliance.

In conclusion, the Data Leaks Detection System on AWS represents a robust solution for organizations seeking to fortify their data protection strategies. By leveraging advanced technologies and stringent security measures, the system empowers organizations to safeguard sensitive information, uphold trust, and adapt to future challenges in an increasingly digital landscape.

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These references provide comprehensive information on cloud security best practices, encryption standards, web development frameworks, and database management systems relevant to designing and implementing a Data Leaks Detection System on a cloud platform like AWS.

**\*\*\*THANK YOU\*\*\***