CYBEROPS: CLOUD-DRIVEN SOC WITH AUTOMATION

A PROJECT REPORT

Submitted By

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in partial fulfilment for the award of the degree

of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND BUSINESS SYSTEMS

CHENNAI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University, Chennai)

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Submitted for the end semester viva-voce held on ……..
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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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ABSTRACT

In the digital era, cybersecurity is crucial for businesses relying on online operations. This project, "CyberOps: Cloud-Driven SOC with Automation," focuses on implementing a Security Operations Center (SOC) using Wazuh SIEM to enhance threat detection, compliance, and automation for a FinTech company handling online transactions. The company stores sensitive financial data, requiring strong security measures to prevent threats, ensure compliance, and secure communications.

The project involves deploying Wazuh SIEM with a Windows 11 endpoint as a monitored agent and a Kali Linux machine as an attacker. Simulated cyberattacks will assess Wazuh's detection capabilities, while malware analysis using ANY.RUN and VirusTotal will enhance threat intelligence.

A key aspect is compliance enforcement, ensuring adherence to PCI-DSS and GDPR through Wazuh's policy monitoring and audits. Given the complexity of on-prem Wazuh deployment, the project explores cloud migration for better scalability.

Additionally, email security will counter phishing, and automated playbooks will enhance incident response. This project strengthens FinTech cybersecurity while demonstrating the benefits of cloud-driven security.

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CHAPTER 1

INTRODUCTION

In today’s digital landscape, cybersecurity plays a vital role in protecting businesses from growing cyber threats. Organizations that rely on digital operations must ensure the security of their data, transactions, and communications. This project, "CyberOps: Cloud-Driven SOC with Automation," focuses on establishing a Security Operations Center (SOC) using Wazuh SIEM to enhance threat detection, compliance enforcement, and security automation.

The need for real-time threat monitoring and automated response has increased significantly, particularly for businesses handling sensitive data. The project is designed for a FinTech startup that provides online payment solutions, digital wallets, and automated invoicing. Since financial transactions are a prime target for cybercriminals, implementing robust security measures is essential.

A Security Information and Event Management (SIEM) solution like Wazuh allows organizations to collect, analyze, and correlate security logs to detect and respond to cyber threats efficiently. The project will focus on configuring Wazuh SIEM in an on-premises setup, integrating it with a Windows 11 target system and a Kali Linux attacker system to simulate real-world cyberattacks. The goal is to assess how effectively Wazuh detects and mitigates security threats in a controlled environment.

Additionally, the project will incorporate malware analysis using ANY.RUN and VirusTotal to investigate malicious activities, automate security responses using playbooks, and enforce compliance with regulations such as PCI-DSS and GDPR. To address scalability and operational efficiency, the project will

also evaluate the challenges of on-prem Wazuh deployment and explore the benefits of migrating to a cloud-based SIEM solution.

A major cybersecurity challenge in FinTech companies is email security, as phishing attacks remain one of the top methods used by cybercriminals to exploit financial businesses. This project will also implement email security measures to ensure that phishing and fraudulent emails are effectively detected and mitigated.

By the end of this project, a fully functional SOC environment will be created, allowing for efficient monitoring, automated security enforcement, and cloud-based scalability. This initiative will demonstrate the importance of SIEM solutions in financial cybersecurity and provide insights into enhancing security automation for businesses that rely on digital operations.

1.1 Background of the Project

The rapid digitalization of financial transactions has increased the risk of cyber threats, making cybersecurity a critical necessity for businesses handling sensitive data. FinTech companies providing online payment solutions, digital wallets, and automated invoicing are frequent targets of phishing, malware, and data breaches, which can lead to financial and reputational damage. To mitigate these risks, organizations need real-time monitoring, threat detection, and compliance enforcement.

Security Information and Event Management (SIEM) solutions like Wazuh provide centralized security monitoring, helping businesses detect anomalies, investigate incidents, and respond to cyber threats efficiently. Wazuh also enables compliance with industry regulations such as PCI-DSS and GDPR, making it a suitable security framework for financial institutions.

This project focuses on deploying Wazuh SIEM in a FinTech environment to establish a Security Operations Center (SOC). The setup includes:

1. A Windows 11 endpoint, which serves as a monitored system, sending security logs to Wazuh.
2. A Kali Linux attacker machine, simulating cyberattacks to evaluate Wazuh's detection capabilities.
3. Malware analysis using ANY.RUN and VirusTotal to investigate and respond to security threats.
4. Automated playbooks for streamlining incident response and threat mitigation.
5. Email security mechanisms to identify and block phishing threats.
6. Cloud migration of Wazuh SIEM to enhance scalability, performance, and operational efficiency.

By implementing these components, this project will demonstrate how Wazuh can secure financial transactions, enhance cybersecurity automation, and maintain compliance, making it a valuable security solution for FinTech companies.

1.2 Objectives of the Project

The objective of this project is to design and implement a Security Operations Center (SOC) using Wazuh SIEM to enhance threat detection, compliance enforcement, and security automation for a FinTech company handling digital transactions. By simulating cyberattacks and monitoring security events, the project aims to demonstrate how Wazuh can effectively detect, analyze, and mitigate threats while ensuring regulatory compliance.

The specific objectives of this project include:

1.2.1 Deploying and Configuring Wazuh SIEM

1. Set up Wazuh SIEM in a virtualized environment to collect and analyze security logs.
2. Establish a Windows 11 endpoint as a monitored system and a Kali Linux attacker machine to evaluate security events.

1.2.2 Simulating Cyber Attacks for Threat Detection

1. Use Kali Linux to perform brute-force attacks, malware execution, and privilege escalation.
2. Assess how Wazuh detects and responds to these threats through real-time monitoring.

1.2.3 Enhancing Security Through Automation

1. Implement automated playbooks to streamline incident response and threat mitigation.
2. Reduce manual intervention by automating security alerts and responses.

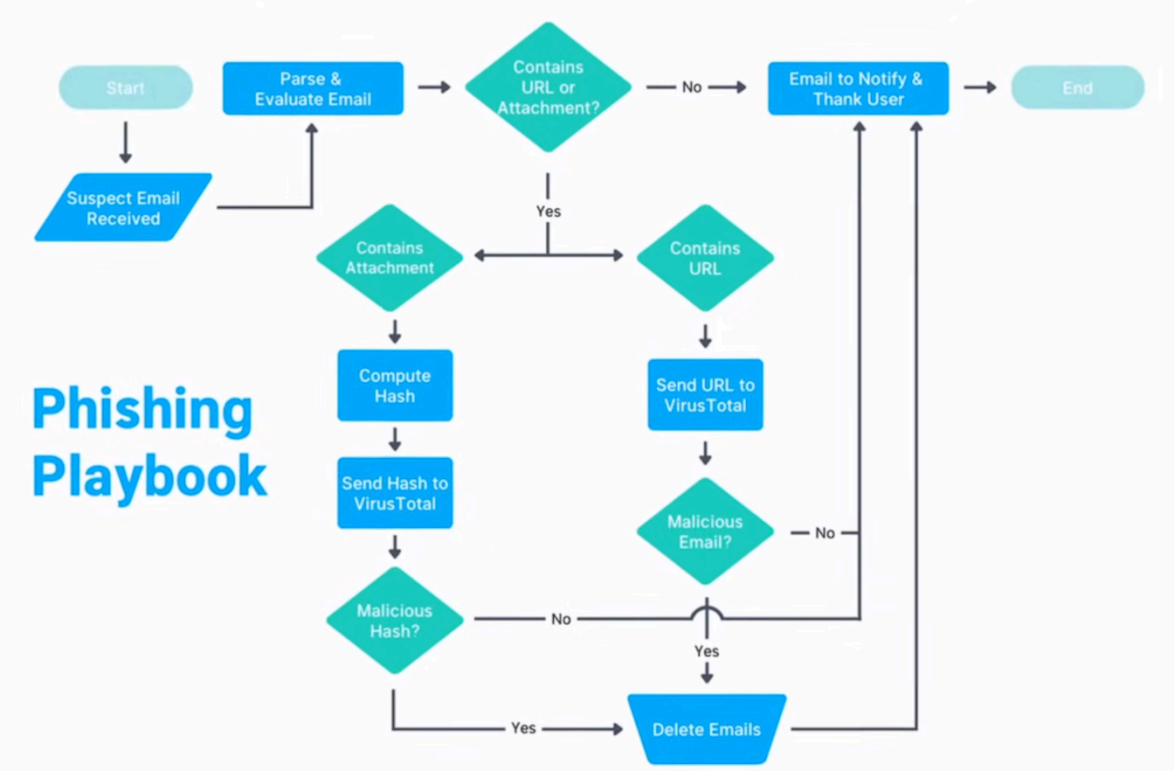

Fig 1.2.3 Phishing Email Analysis Playbook for Automation

1.2.4 Performing Malware Analysis

1. Utilize ANY.RUN and VirusTotal to analyze malware samples and assess Wazuh's detection capabilities.
2. Improve threat intelligence by correlating malware findings with security alerts.

1.2.5 Implementing Compliance and Email Security

1. Ensure PCI-DSS and GDPR compliance using Wazuh's built-in security policies.
2. Implement email security measures to detect and block phishing and fraudulent emails.

1.2.6 Migrating Wazuh to a Cloud-Based SOC

1. Identify challenges in managing an on-premises Wazuh deployment.
2. Explore cloud-based Wazuh for scalability, cost efficiency, and ease of management.

By achieving these objectives, this project will demonstrate how Wazuh SIEM can enhance cybersecurity, ensure compliance, and improve incident response in a FinTech security environment.

1.3 Scope of the Project

The scope of this project is to implement a Security Operations Center (SOC) using Wazuh SIEM for a FinTech company handling online payment solutions, digital wallets, and automated invoicing. This project will focus on real-time security monitoring, threat detection, compliance enforcement, and automation to enhance the organization's overall cybersecurity posture.

The project will cover the following key areas:

1.3.1 Security Monitoring and Threat Detection

Deploy Wazuh SIEM to monitor security events from the Windows 11 endpoint and detect potential threats.

Set up Kali Linux as an attacker system to simulate cyberattacks, including brute-force attacks, privilege escalation, and malware execution.

Analyse security logs to detect anomalies and generate alerts for suspicious activities.

1.3.2 Malware Analysis and Threat Intelligence

Perform malware analysis using ANY.RUN and VirusTotal to understand attack behaviours.

Improve threat intelligence by correlating malware data with Wazuh alerts.

1.3.3 Security Automation and Incident Response

Implement automated playbooks to streamline incident detection and response.

Reduce manual efforts by automating the remediation of detected threats.

1.3.4 Compliance and Regulatory Enforcement

Ensure compliance with PCI-DSS and GDPR through Wazuh's policy enforcement.

Generate security reports to verify regulatory adherence.

1.3.5 Email Security Enhancement

Implement email filtering and monitoring mechanisms to detect phishing and fraud attempts.

Strengthen email security policies to protect against social engineering attacks.

1.3.6 Cloud Migration for Scalability

Evaluate the challenges of managing Wazuh SIEM on-premises.

Implement cloud-based Wazuh SIEM for scalability, efficiency, and centralized security monitoring.

Out of Scope

The project will not cover third-party security integrations beyond Wazuh.

No live production environment deployment—all testing will be conducted in a virtualized lab setup.

By implementing these components, this project will demonstrate how Wazuh SIEM can be leveraged for real-time security monitoring, automated threat detection, and compliance management in a FinTech security environment.

1.4 Motivation

The motivation behind this project stems from the growing cybersecurity challenges faced by FinTech companies, which handle sensitive financial data and are prime targets for cyberattacks. As online transactions increase, so do threats such as data breaches, phishing, malware infections, and compliance violations. Ensuring real-time monitoring, automated threat detection, and regulatory compliance is crucial for safeguarding financial operations.

Many businesses struggle to implement cost-effective and efficient Security Operations Centers (SOC). Traditional SIEM solutions are often expensive and complex, making them impractical for startups and mid-sized organizations. Wazuh, an open-source SIEM, offers a scalable, cost-efficient

alternative with threat detection, log analysis, and compliance monitoring. This project explores how FinTech businesses can leverage Wazuh to build an effective SOC without excessive costs.

Another key motivation is security automation. Manual threat response is slow and inefficient, increasing the risk of successful attacks. By integrating automated playbooks, this project aims to reduce response time and improve security efficiency. Additionally, email security remains a major concern, with phishing attacks being a leading cause of financial fraud. Implementing email filtering and monitoring solutions will help mitigate these risks.

Finally, scalability is essential as businesses grow. Managing an on-premises Wazuh SIEM can be complex, so this project will also explore cloud migration to enhance scalability, reliability, and ease of management. By addressing these challenges, this project will demonstrate the practical benefits of Wazuh SIEM in a FinTech security environment.

CHAPTER 2

LITERATURE REVIEW

Cybersecurity in FinTech organizations has evolved significantly due to the rising number of cyber threats targeting financial transactions. Various Security Information and Event Management (SIEM) solutions have been developed to monitor, detect, and mitigate threats in real time. This literature review explores existing cybersecurity measures, evaluates SIEM solutions, and highlights the need for automated security operations.

2.1 Existing Cybersecurity Challenges in FinTech

Studies indicate that FinTech companies face persistent threats such as phishing, malware attacks, and unauthorized access (Smith & Brown, 2020). A Ponemon Institute report (2021) highlights that financial institutions experience an average of 300 cyberattacks per year, leading to data breaches and financial fraud. Traditional security measures, such as firewalls and endpoint security solutions, are often insufficient in preventing advanced threats.

2.2 SIEM as a Security Solution

In this project, Wazuh SIEM (Security Information and Event Management) plays a pivotal role in ensuring real-time security monitoring, threat detection, and compliance enforcement within the FinTech environment. The system is designed to collect, analyze, and correlate security events from various sources, including network traffic, endpoint logs, system activities, and application events, to identify suspicious behavior and potential cyber threats. By deploying Wazuh agents on Windows 11 endpoints, the SOC can detect anomalies such as unauthorized access attempts, privilege escalations, malware infections, and policy violations, ensuring a proactive approach to cybersecurity.

Beyond monitoring, the project leverages Wazuh SIEM's built-in rule engine and correlation capabilities to prioritize security incidents based on severity, reducing false positives and allowing security analysts to focus on critical threats. The integration of threat intelligence platforms like ANY.RUN and VirusTotal further enhances malware detection and threat-hunting capabilities, helping to analyze malicious files, URLs, and suspicious network activity in real time. Additionally, automated security playbooks are implemented within

the SIEM framework to trigger predefined response actions, such as isolating compromised endpoints, blocking malicious IPs, and sending alerts to security teams.

Given the scalability challenges of an on-premises SIEM, the project also explores the migration of Wazuh to a cloud-based architecture, enabling centralized security management, improved log retention, and efficient processing of high-volume security events. Cloud integration ensures that FinTech organizations can scale their security operations dynamically, adapting to increasing cyber threats while maintaining compliance with PCI-DSS and GDPR. Through continuous log analysis, compliance audits, and automated incident response mechanisms, this project aims to demonstrate how a cloud-driven SIEM enhances security posture, reduces response time, and fortifies FinTech operations against evolving cyber threats.

2.3 Wazuh as an Open-Source Alternative

Wazuh SIEM has gained popularity as a cost-effective, open-source solution that provides real-time monitoring, log analysis, and compliance auditing (Kaur et al., 2022). It integrates intrusion detection, vulnerability assessment, and automated security responses, making it a suitable choice for FinTech companies with budget constraints. However, research suggests that on-premises Wazuh deployment can be complex, requiring proper configuration and optimization for large-scale monitoring.

2.4 Security Automation and Email Protection

Automation has become a crucial factor in modern cybersecurity strategies. Studies show that manual incident response leads to delays in threat mitigation, increasing the risk of security breaches (Bhatt & Gokhale, 2019).

The integration of automated playbooks enhances response efficiency by executing predefined actions when security incidents occur. Additionally, email-based attacks remain a major cybersecurity concern, with research indicating that 90% of data breaches originate from phishing attacks (Alcaraz & Zeadally, 2015). Implementing email security measures within a SIEM environment can significantly reduce financial fraud risks.

Email security in this project focuses on mitigating phishing attacks and email-borne threats, which are major risks in the FinTech sector. By integrating Wazuh SIEM with email security solutions, the system can analyze email logs, detect suspicious patterns, and flag phishing attempts in real time. Additionally, threat intelligence from ANY.RUN and VirusTotal will be leveraged to identify malicious attachments or links, preventing credential theft and financial fraud. Automated security playbooks will further enhance incident response by triggering alerts, quarantining malicious emails, and enforcing security policies, ensuring a proactive defense against evolving email threats.

2.5 Findings and Conclusion

The literature review highlights the growing need for cost-effective, automated security solutions in the FinTech industry. Traditional SIEM tools offer robust security but are costly, whereas Wazuh provides a budget-friendly, open-source alternative with essential security features. However, managing Wazuh on-premises presents challenges, making cloud migration a viable option for scalability and ease of management. Additionally, automating security operations and improving email security are critical in enhancing cybersecurity resilience.

This project builds on these findings by deploying Wazuh SIEM in a FinTech environment, integrating attack simulations, security automation, compliance monitoring, and cloud migration to evaluate its effectiveness in real-world cybersecurity scenarios.

CHAPTER 3

PROBLEM STATEMENT & SOLUTION

The rise of cyber threats targeting FinTech companies has created significant challenges in securing financial transactions, customer data, and business operations. Cybercriminals use phishing, malware, unauthorized access, and exploitation of system vulnerabilities to compromise financial services. Ensuring real-time monitoring, rapid incident response, and regulatory compliance is critical for protecting sensitive data.

Traditional security approaches, such as firewalls and standalone antivirus solutions, are no longer sufficient to defend against modern cyber threats. Security teams struggle with handling large volumes of security logs, detecting sophisticated attacks, and responding effectively. Additionally, manual security operations delay incident response, increasing the risk of financial fraud and data breaches.

Another major challenge is compliance with industry regulations like PCI-DSS and GDPR, which require organizations to implement strong security controls, regular audits, and incident reporting mechanisms. Many

companies lack cost-effective and efficient solutions to meet these compliance requirements.

To address these challenges, this project proposes the implementation of a Security Operations Center (SOC) using Wazuh SIEM. The Wazuh framework will enable:

1. Real-time security monitoring by collecting logs from endpoints and detecting anomalies.
2. Threat detection and automated response through security rules and correlation of security events.
3. Attack simulations using a Kali Linux machine to evaluate Wazuh's effectiveness.
4. Malware analysis with ANY.RUN and VirusTotal to enhance threat intelligence.
5. Email security mechanisms to prevent phishing attacks.
6. Regulatory compliance enforcement using Wazuh's built-in compliance monitoring.
7. Cloud migration of Wazuh SIEM for improved scalability and efficiency.

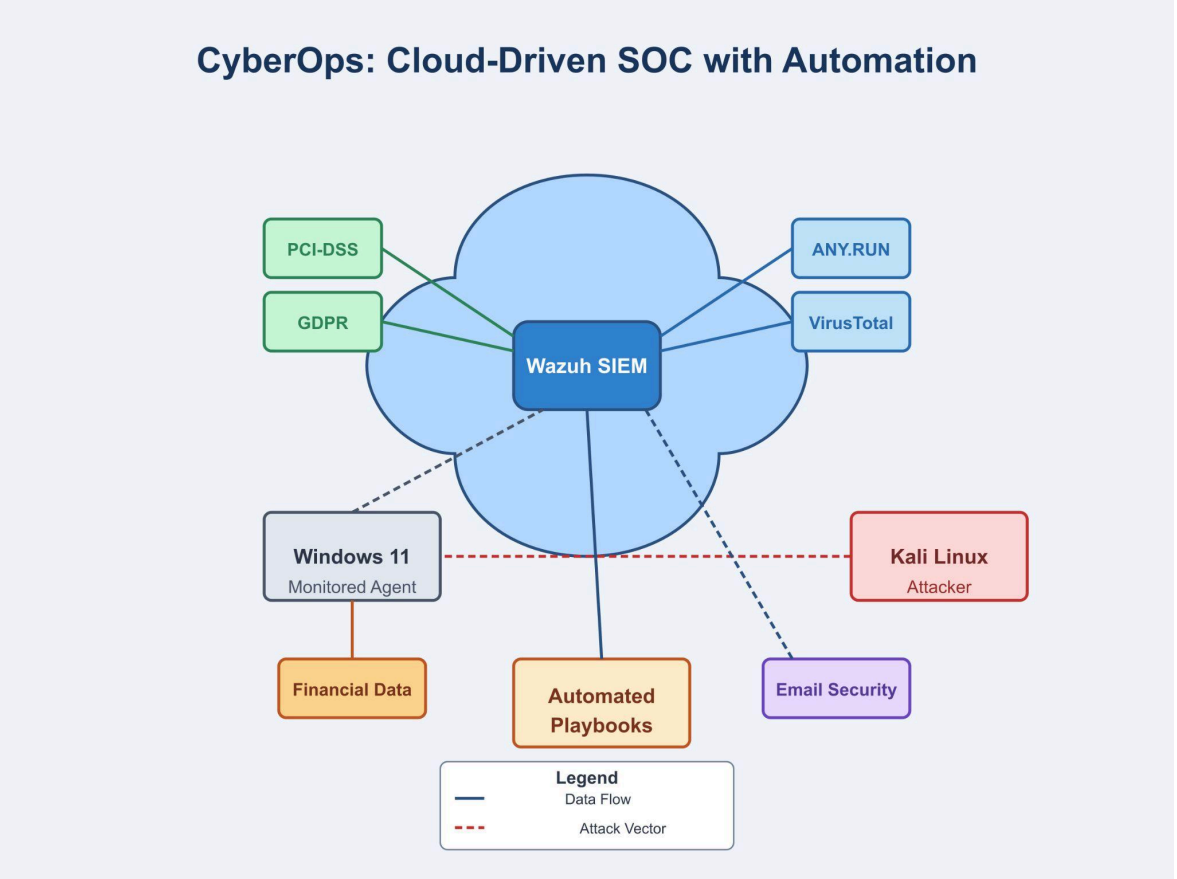

Fig 3.1 Architecture Overview

This solution will establish a cost-effective, scalable, and automated cybersecurity framework that enhances threat detection, security automation, and regulatory compliance for FinTech companies.

3.1 Overview of Existing Security Challenges

FinTech companies face constant cybersecurity threats due to their reliance on digital transactions and cloud-based services. Cybercriminals use phishing, malware, ransomware, and unauthorized access to target financial systems, leading to data breaches, fraud, and regulatory violations.

Traditional firewalls and antivirus solutions are no longer sufficient to detect sophisticated cyberattacks. Security teams struggle with managing large

volumes of security logs, leading to delayed threat detection and response. Additionally, manual security operations increase the risk of overlooking critical threats.

Regulatory compliance, such as PCI-DSS and GDPR, adds another layer of complexity, requiring organizations to implement strict security policies, audits, and reporting mechanisms. Many companies lack cost-effective SIEM solutions that provide real-time monitoring, security automation, and compliance enforcement.

To address these challenges, organizations must adopt a centralized, automated, and scalable cybersecurity framework that ensures effective threat detection, rapid response, and compliance adherence.

3.2 Identified Security Gaps

Despite implementing basic security measures, many FinTech companies face gaps in threat detection, incident response, and compliance enforcement. Key security gaps include:

3.2.1 Lack of Real-Time Monitoring – Traditional security tools fail to provide continuous threat detection, leaving businesses vulnerable to advanced cyberattacks.

3.2.2 Delayed Incident Response – Manual investigation and response to security events cause delays, increasing the risk of data breaches and financial fraud.

3.2.3 Inefficient Log Management – Security teams struggle with analyzing large volumes of logs, making it difficult to detect anomalies and threats in real-time.

3.2.4 Weak Compliance Enforcement – Many organizations lack automated security controls to meet PCI-DSS and GDPR requirements, leading to regulatory risks.

3.2.5 Email-Based Threats – Phishing attacks remain a major entry point for cybercriminals, yet many companies lack effective email security measures.

Addressing these gaps requires a centralized, automated security solution that integrates threat detection, security automation, and compliance monitoring to strengthen FinTech cybersecurity.

CHAPTER 4

METHODOLOGY & IMPLEMENTATION

This chapter outlines the technical approach used to implement a Security Operations Center (SOC) using Wazuh SIEM for a FinTech company. The methodology involves deploying a security monitoring system, simulating cyberattacks, automating threat detection, enforcing compliance, securing email communication, and migrating to a cloud-based SOC.

The implementation is divided into the following key phases:

1. System Requirements – Defining the hardware and software specifications needed for Wazuh SIEM deployment.
2. Environment Setup and Attack Simulation – Configuring a Windows 11 endpoint (target system), a Kali Linux attacker machine, and a Wazuh SIEM server for security monitoring.

3. Security Event Detection and Automation – Using Wazuh to monitor security logs, detect anomalies, and automate incident responses with playbooks.
4. Compliance Enforcement – Ensuring that the system meets PCI-DSS and GDPR requirements by implementing audit and security controls.
5. Email Security Implementation – Deploying email filtering and monitoring mechanisms to detect phishing attacks and fraudulent activities.
6. Migration to Cloud – Exploring the challenges of an on-premises Wazuh deployment and transitioning to a cloud-based SOC for scalability and efficiency.

The following sections provide a detailed breakdown of each phase, including the tools, configurations, and processes used to implement a robust cybersecurity monitoring system.

4.1 System Requirements

The project requires a virtualized environment to deploy Wazuh SIEM, a Windows 11 endpoint, and a Kali Linux attacker system. The following are the minimum system requirements for each virtual machine (VM):

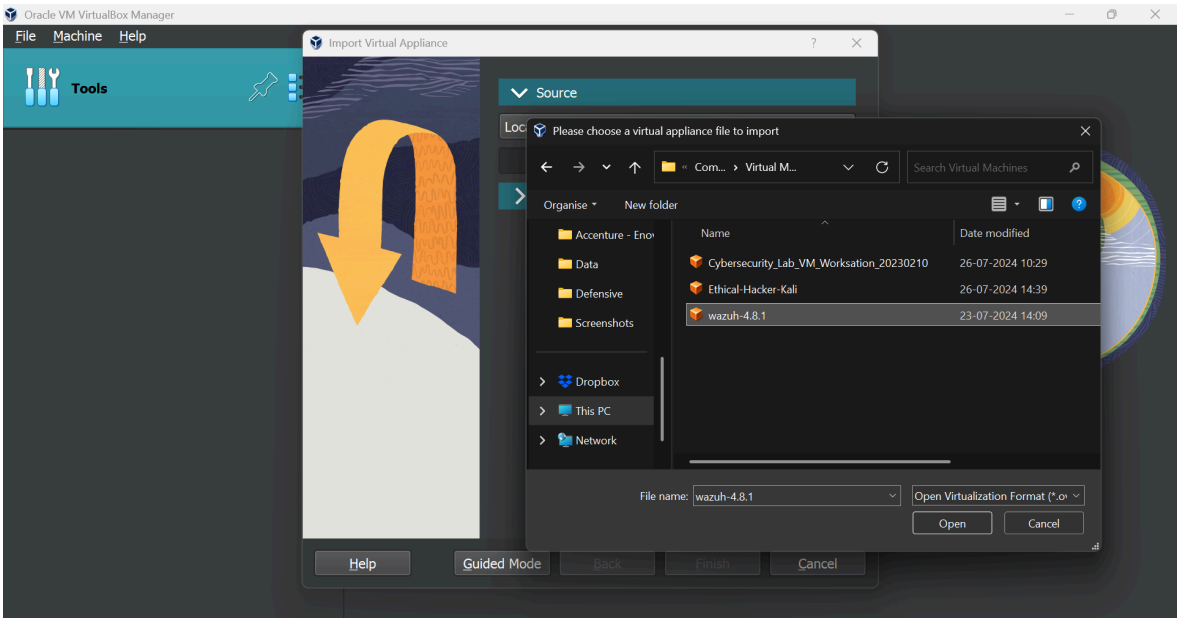

Fig 4.1 VM installation

4.1.1 Wazuh SIEM Server

1. Processor: 4 vCPUs (Recommended: 8 vCPUs)
2. RAM: 8GB (Recommended: 16GB for large-scale monitoring)
3. Storage: 50GB SSD (Expandable based on log retention needs)
4. OS: Ubuntu 20.04 LTS or later
5. Software: Wazuh Manager, Elasticsearch, Kibana (already in Wazuh)

Nmap Scan Detection Rule for Wazuh:

- CLI connection to Wazuh Server
- Command:
  sudo nano /var/ossec/rules/local_rules.xml

<group name="network_scan, nmap, intrusion_attempt">

<rule id="100006" level="10">

<decoded_as>json</decoded_as>

<field name="eventid">400000</field>

<!-- Custom network monitoring event -->

<field name="src_ip">192.168.1.*</field>

<!-- Internal network range -->

<field name="dest_port">22|80|443|445|3389</field>

<!-- Commonly scanned ports -->

<description>Potential Nmap scan detected</description>

<frequency>10</frequency>

<!-- 10 connection attempts -->

<timeframe>30</timeframe>

<!-- Within 30 seconds -->

<options>alert_by_email, block_ip</options>

</rule> </group>

- Save the file
- Command:
  sudo systemctl restart wazuh-manager

Configure Active Response for Automated Blocking:

- CLI connection to Wazuh Server
- Command:
  sudo nano /var/ossec/etc/ossec.conf

<command>

<name>firewalld</name>

<executable>firewalld</executable>

<expect>srcip</expect>

<timeout_allowed>yes</timeout_allowed>

</command>

<active-response>

<command>firewalld</command>

<location>local</location>

<level>10</level>

</active-response>

- Save the file
- Command:
  sudo systemctl restart wazuh-manager

4.1.2 Windows 11 Endpoint (Target System)

1. Processor: 2 vCPUs
2. RAM: 4GB (Recommended: 8GB for better performance)
3. Storage: 40GB
4. OS: Windows 11 Pro
5. Software: Wazuh Agent, Sysmon, Microsoft Defender

4.1.3 Kali Linux (Attacker System)

1. Processor: 2 vCPUs
2. RAM: 4GB
3. Storage: 30GB
4. OS: Kali Linux (Latest version)
5. Software: Metasploit, Nmap, Wireshark, Hydra

4.1.4 Virtualization & Networking

1. Hypervisor: VMware Workstation / VirtualBox
2. Network Mode: Host-Only and NAT (for attack simulation and SIEM communication)

These configurations ensure a stable testing environment for threat detection, log analysis, and security automation using Wazuh SIEM.

4.2 Environment Setup and Attack Simulation

To evaluate Wazuh SIEM's security monitoring capabilities, a virtualized test environment is created, consisting of three virtual machines (VMs):

1. Wazuh SIEM Server – Responsible for log collection, security event detection, and compliance monitoring.
2. Windows 11 Endpoint – Acts as the target system, simulating an enterprise workstation that generates logs.
3. Kali Linux Attacker – Used for penetration testing and attack simulation to assess Wazuh's detection capabilities.

4.2.1 Setting Up Wazuh SIEM Server

1. Install Ubuntu 20.04 LTS and set up Wazuh Manager, Elasticsearch, and Kibana.
2. Configure log collection and event correlation rules to detect security threats.
3. Enable compliance modules to enforce PCI-DSS and GDPR policies.

4.2.2 Configuring Windows 11 Endpoint

1. Install Wazuh Agent to forward security logs and system events to the Wazuh SIEM server.
2. Deploy Sysmon to generate detailed process creation, registry, and network activity logs.
3. Enable Windows Defender logs to detect malware activities.

4.2.3 Deploying Kali Linux Attacker

1. Install offensive security tools such as Metasploit, Nmap, Hydra, and Mimikatz.

2. Simulate brute-force attacks, privilege escalation, malware execution, and reverse shells.
3. Observe how Wazuh detects and generates alerts for these malicious activities.

4.2.4 Network Configuration

1. Use NAT and Host-Only networks to create a controlled test environment.
2. Configure firewall rules to allow log forwarding from Windows 11 to Wazuh.
3. Monitor network traffic and intrusion attempts using Wazuh's built-in IDS capabilities.

This structured test environment ensures that Wazuh SIEM can identify security threats, analyze attack patterns, and automate responses effectively, simulating a real-world Security Operations Center (SOC) setup.

4.3 Security Event Detection and Automation

One of the primary objectives of this project is to detect security threats in real-time and automate incident response using Wazuh SIEM. By integrating log collection, event correlation, and automated playbooks, this setup helps organizations identify, analyze, and mitigate cyber threats efficiently.

4.3.1 Log Collection and Event Correlation

1. Wazuh Agent on the Windows 11 endpoint collects system logs, process activities, file changes, and network traffic.

2. Sysmon logs are forwarded to Wazuh, providing detailed insight into malicious activities like unauthorized access, registry modifications, and malware execution.
3. Wazuh's built-in intrusion detection system (IDS) monitors logs for suspicious patterns and correlates security events.

4.3.2 Attack Detection and Alerting

1. Brute-force attacks, privilege escalation, and malware execution from Kali Linux are simulated.
2. Wazuh generates real-time alerts based on predefined rules and signatures.
3. Alerts are categorized into low, medium, and high-severity incidents, enabling security analysts to prioritize threats.

4.3.3 Security Automation with Playbooks

1. Automated response mechanisms are implemented using security playbooks.
2. If a brute-force attack is detected, Wazuh triggers an automated block on the attacker's IP.
3. Malware detection initiates an automated quarantine of infected files.
4. Phishing email detections trigger alerts and automatically flag malicious emails.

4.3.4 Incident Investigation and Mitigation

1. Detected threats are analyzed using Wazuh's security dashboards in Kibana.
2. Logs are cross-checked with VirusTotal and ANY.RUN for malware signatures.

3. Automated ticketing integration helps security teams track and resolve incidents efficiently.

By combining real-time detection, event correlation, and automated response, this project ensures that threats are identified early and mitigated effectively, reducing manual security efforts and response time.

4.4 Compliance Enforcement

Ensuring regulatory compliance is critical for FinTech companies that handle sensitive financial data. This project leverages Wazuh SIEM to enforce compliance with PCI-DSS and GDPR through log monitoring, audit reporting, and security policy enforcement.

4.4.1 Log Auditing and Policy Monitoring

1. Wazuh collects and analyzes system logs, user activities, and access control changes to ensure compliance.
2. Security policies are enforced to detect unauthorized data access, privilege misuse, and policy violations.

4.4.2 PCI-DSS Compliance Implementation

1. File Integrity Monitoring (FIM) tracks changes in critical system files and payment transaction logs.
2. Real-time alerts are generated for unauthorized access attempts or security misconfigurations.

4.4.3 GDPR Compliance and Data Protection

1. Monitors data access logs to detect potential data leaks or breaches.

2. Ensures encryption policies and security controls are in place to protect customer information.

4.4.4 Automated Compliance Reporting

1. Wazuh generates compliance audit reports, reducing manual efforts for security assessments.
2. Logs are stored securely for regulatory audits and investigations.

By implementing automated compliance monitoring, this project helps organizations maintain regulatory adherence, reduce security risks, and ensure financial data protection.

4.5 Email Security Implementation

Implementing robust email security measures is crucial for protecting organizations from threats such as phishing attacks, malware distribution, and unauthorized access. This section outlines a comprehensive approach to enhance email security within a Security Operations Center (SOC) framework, focusing on phishing email analysis and the implementation of technical defences.

4.5.1 Phishing Email Analysis

As SOC analysts, systematically examining suspicious emails is vital to identify and mitigate potential threats. The following steps provide a structured methodology for effective email phishing analysis:

4.5.1.1 Sender and Domain Verification

1. Examine Sender Details: Verify the sender's email address and domain for legitimacy. Attackers often use deceptive addresses that closely resemble trusted domains.
2. Assess Domain Reputation: Utilize tools like VirusTotal and MXToolbox to evaluate the domain's reputation and identify any associations with malicious activities.

4.5.1.2 Subject Line Evaluation

1. Identify Suspicious Elements: Analyze the subject line for indications of phishing or social engineering tactics, such as urgent requests or enticing offers.

4.5.1.3 Email Body Inspection

1. Detect Indicators of Compromise (IOCs): Look for signs such as urgent language, unsolicited attachments, or embedded links.
2. Analyze URLs and Attachments: Use secure methods to inspect embedded links and attachments without exposing the network to potential threats.

4.5.1.4 Email Header Analysis

1. Retrieve and Analyze Headers: Examine email headers to trace the email's origin and identify anomalies. Tools like MXToolbox can assist in this analysis.

4.5.1.5 Authentication Checks

1. Verify SPF, DKIM, and DMARC: Ensure that the email passes these authentication checks to confirm its legitimacy.

4.5.1.6 Mail Gateway Review

1. Cross-Check Delivery Paths: Review the email's journey through mail gateways to detect any irregularities or signs of compromise.

4.5.1.7 Reporting and Mitigation

1. Document Findings: Record all analysis results and identified IOCs.
2. Implement Countermeasures: Collaborate with IT teams to block malicious domains, IPs, or email addresses based on the analysis.

4.5.2 Technical Defences

Beyond analysis, implementing technical measures strengthens the organization's defence against email-based threats:

4.5.2.1 Email Filtering Solutions

1. Deploy Advanced Filters: Implement spam and phishing filters that utilize machine learning to detect and block malicious emails.

4.5.2.2 Multi-Factor Authentication (MFA)

1. Enforce MFA: Require multiple authentication factors for email access to add an additional security layer, mitigating risks from compromised credentials.

4.5.2.3 Regular Security Assessments

1. Conduct Phishing Simulations: Perform regular phishing tests to assess and improve employee awareness and response to phishing attempts.

4.5.2.4 User Training and Awareness

1. Educate Employees: Provide ongoing training on recognizing phishing attempts and safe email practices to empower users as the first line of defence.

By integrating meticulous email analysis procedures with robust technical defences, organizations can significantly enhance their resilience against email-based threats, safeguarding critical assets and maintaining operational integrity.

4.6 Migration to Cloud

As cybersecurity threats continue to evolve, organizations require scalable and efficient security monitoring solutions. Initially, this project deployed Wazuh SIEM on-premises to manage security logs and analyze threats. However, as additional agent systems were added, the on-premises Wazuh SIEM server faced operational challenges, making security monitoring inefficient.

Due to increased log ingestion, limited storage, and resource constraints, we decided to migrate to Wazuh Cloud, leveraging its 15-day free trial. This transition allowed for better scalability, enhanced performance, and automated security management without infrastructure limitations.

4.6.1 Challenges Faced in On-Premises Deployment

4.6.1.1 Storage Limitations

As the project scaled with multiple agent systems forwarding security logs to the Wazuh SIEM server, the VM's disk space became insufficient. The volume of logs increased exponentially due to:

1. Windows 11 endpoint monitoring generating process logs, registry changes, and network activity.
2. Simulated cyberattacks from the Kali Linux attacker, producing security alerts.

3. Malware analysis logs, collected from sandbox environments such as ANY.RUN and VirusTotal.

This rapid growth filled the allocated storage on the VM, leading to delays in log indexing and processing. Real-time security monitoring was affected, as Wazuh struggled to correlate security events efficiently.

4.6.1.2 Performance Bottlenecks

The on-premises deployment required high CPU and memory resources to analyze security events, process large datasets, and detect anomalies. As log volume increased:

1. SIEM event correlation slowed down, delaying alert generation.
2. Querying stored logs became sluggish, impacting security investigations.
3. Memory and CPU usage spiked, leading to system instability.

The on-prem infrastructure lacked elastic scalability, forcing manual upgrades that were time-consuming and resource-intensive.

4.6.1.3 Scalability Issues

As more endpoints were added, on-prem Wazuh SIEM required continuous hardware expansion. This presented several challenges:

1. Difficulty in onboarding new agent systems, requiring manual configurations.
2. Log storage limitations, forcing frequent log rotation and deletion.
3. Lack of high availability, meaning any system failure could disrupt security monitoring.

Due to these challenges, migrating to a cloud-based Wazuh deployment became necessary to ensure efficient, scalable, and uninterrupted security monitoring.

4.6.2 Migration to Wazuh Cloud

Wazuh Cloud provides a fully managed SIEM solution, eliminating the need for on-prem resource management while enhancing security visibility, automation, and compliance enforcement.

4.6.2.1 Benefits of Wazuh Cloud Over On-Premises

Feature	On-Prem Wazuh SIEM	Wazuh Cloud
Storage Capacity	Limited by local disk space	Scalable cloud storage
Performance	High resource consumption	Optimized performance
Security Automation	Requires manual configuration	Predefined automated workflows
Compliance Monitoring	Manual audit management	Built-in PCI-DSS, GDPR policies
Log Retention	Limited retention due to disk constraints	Extended retention based on cloud plan
Scalability	Manual expansion required	Elastic scalability
Availability	Downtime risk during system failures	High availability with cloud redundancy

4.6.2.2 Migration Process

To migrate from on-prem Wazuh SIEM to Wazuh Cloud, the following steps were performed:

Step 1: Signing Up for Wazuh Cloud

1. Registered for Wazuh Cloud's 15-day free trial to assess cloud capabilities.
2. Configured the cloud SIEM dashboard to mirror on-prem settings.

Step 2: Agent Reconfiguration

1. Uninstalled Wazuh Agents from the Windows 11 endpoint and Kali Linux attacker.
2. Reconfigured agents to send logs to Wazuh Cloud instead of the local SIEM server.

Step 3: Data Migration & Log Management

1. Exported historical logs from the on-prem SIEM for reference.
2. Verified real-time log ingestion from Windows 11 and Kali Linux to Wazuh Cloud.

Step 4: Security Event Validation

1. Simulated brute-force attacks and malware execution to test log detection.
2. Ensured Wazuh Cloud generated alerts in real-time without delays.

Step 5: Compliance and Automation Testing

1. Verified built-in compliance monitoring for PCI-DSS and GDPR.
2. Tested automated security responses using Wazuh's predefined playbooks.

4.6.3 Key Advantages of Wazuh Cloud Deployment

4.6.3.1 Elastic Storage & Performance Optimization

Migrating to Wazuh Cloud eliminated storage limitations and resource constraints by leveraging:

1. Cloud-based log storage, allowing indefinite retention without manual log rotation.
2. Optimized performance, reducing CPU and memory overhead.
3. Fast event correlation, enabling real-time threat detection.

Fig 4.6.3 Log Collection

4.6.3.2 Enhanced Security Automation

Wazuh Cloud provides automated security workflows, reducing manual intervention in threat detection and response. Key improvements include:

1. Automated threat mitigation (e.g., blocking malicious IPs, quarantining infected files).
2. Email security enhancements through phishing detection and domain reputation analysis.
3. Security dashboards with global threat intelligence (GTI) to improve attack analysis.

4.6.3.3 High Availability & Scalability

Unlike on-prem deployments, Wazuh Cloud ensures:

1. 99.9% uptime with redundant cloud infrastructure.
2. Seamless addition of new endpoints, improving scalability.
3. Automatic updates and maintenance, reducing administrative overhead.

4.6.4 Conclusion

Migrating from on-prem Wazuh SIEM to Wazuh Cloud significantly improved performance, scalability, and security automation. The transition resolved storage inefficiencies, performance bottlenecks, and scalability challenges, ensuring uninterrupted security monitoring.

With cloud-based threat detection, compliance enforcement, and automated responses, Wazuh Cloud proved to be an ideal SOC solution for FinTech security monitoring, offering:

1. Real-time security insights without hardware limitations.
2. Seamless endpoint onboarding for growing infrastructure.
3. Integrated compliance monitoring for regulatory adherence.

By leveraging Wazuh Cloud, FinTech organizations can strengthen cybersecurity resilience while reducing operational complexity and maintenance overhead.

CHAPTER 5

RESULT

The deployment of Wazuh SIEM, along with security event detection, compliance enforcement, and email security measures, has demonstrated its effectiveness in monitoring, detecting, and responding to cybersecurity threats. This chapter presents a theoretical evaluation of the system's performance, highlighting how it enhances organizational security, threat visibility, and compliance adherence.

5.1 Security Monitoring and Threat Visibility

One of the primary objectives of this project was to establish a centralized security monitoring system capable of detecting suspicious activities, logging critical security events, and providing real-time alerts.

5.1.1 Network Activity Monitoring

In any security operations environment, continuous monitoring of network traffic is essential to detect unauthorized access attempts and potential cyber threats. In this project, the attacker system, Kali Linux, was used to simulate network scanning, password cracking, and malware execution. These activities generated security logs that were forwarded to Wazuh SIEM for analysis.

1. Nmap scans, commonly used for network reconnaissance, were logged by Wazuh and flagged as potential port scanning activity. This reinforces how an SIEM can identify early-stage attacks before exploitation occurs.
2. Password cracking attempts targeting the SSH service on the Windows 11 endpoint were successfully logged. Wazuh correlated multiple failed authentication attempts, identifying a potential brute-force attack and triggering an alert.

3. Malware execution was detected through behavioral analysis and system monitoring. Suspicious processes were identified and logged, allowing analysts to investigate potential system compromise.

The ability of Wazuh to collect, analyze, and alert on network activity highlights its role as a proactive security measure, allowing security teams to respond before an attack escalates into a full-blown breach.

5.2 Incident Response and Automated Security Actions

While detection of security events is essential, organizations benefit greatly from automated incident response mechanisms that minimize the need for manual intervention.

5.2.1 Security Event Correlation

By correlating security events across multiple log sources, Wazuh SIEM helps identify patterns indicative of an ongoing attack. For example, if a network scan is followed by failed login attempts, Wazuh automatically categorizes the activity as a potential intrusion attempt rather than isolated events.

This type of correlation is crucial for organizations, as manual log analysis is time-consuming and can lead to missed security incidents. With Wazuh's event correlation capabilities, alerts are prioritized based on severity, allowing security teams to focus on high-risk threats first.

5.2.2 Importance of Automated Alerts

One of the key challenges faced by security teams is alert fatigue, where analysts are overwhelmed with numerous security notifications. Wazuh mitigates this issue by:

1. Generating real-time alerts based on pre-configured rules.
2. Prioritizing alerts based on threat severity and potential risk to the system.
3. Enabling automated response mechanisms such as blocking malicious IPs or quarantining malware.

By automating security actions, organizations can respond to threats faster, reducing the likelihood of a successful attack.

5.3 Compliance Enforcement and Regulatory Adherence

For FinTech organizations, regulatory compliance is not just a best practice—it is a legal requirement to protect customer data and maintain trust. This project has demonstrated how Wazuh can be utilized to enforce compliance with frameworks such as PCI-DSS and GDPR.

5.3.1 PCI-DSS Compliance for Payment Security

Payment Card Industry Data Security Standard (PCI-DSS) requires organizations handling financial transactions to:

1. Monitor system activity for unauthorized access attempts.
2. Encrypt sensitive data to prevent unauthorized disclosure.
3. Enforce strict authentication policies to prevent identity theft.

By implementing Wazuh's log monitoring and file integrity monitoring (FIM) capabilities, this project has shown how organizations can:

1. Detect unauthorized access attempts in real time.
2. Ensure data integrity by monitoring file modifications.
3. Generate compliance reports to facilitate audit readiness.

5.3.2 GDPR Compliance for Data Protection

Under General Data Protection Regulation (GDPR), organizations must protect user data privacy and be transparent about data handling practices. Wazuh helps achieve compliance by:

1. Monitoring data access logs to detect suspicious behavior.
2. Enforcing encryption and access control policies to prevent data leaks.
3. Generating compliance reports for regulatory audits.

Through centralized security event monitoring and automated compliance tracking, Wazuh helps organizations avoid legal penalties and maintain a secure, trustworthy infrastructure.

5.4 Importance of Email Security in a FinTech Environment

Email remains a critical communication channel for financial organizations, making it a primary attack vector for cybercriminals. Phishing attacks targeting employee credentials, financial transactions, and customer accounts pose a serious risk to FinTech businesses.

5.4.1 Current Trends in Email Security Threats

1. Rise of Phishing Attacks: Attackers use social engineering techniques to trick employees into revealing credentials or downloading malware-infected attachments.
2. Business Email Compromise (BEC): Cybercriminals impersonate executives to trick employees into authorizing fraudulent transactions.
3. Ransomware via Email: Many ransomware attacks originate from malicious email attachments disguised as legitimate files.

5.4.2 Implementing Email Security with Wazuh

In this project, email security was enhanced using Wazuh's monitoring capabilities. Suspicious emails were analyzed based on:

1. Sender authenticity (SPF, DKIM, and DMARC verification).
2. Malicious attachments and embedded links (scanned for malware signatures).
3. Phishing indicators (urgent language, spoofed domains, and financial fraud attempts).

5.4.3 How Email Security Benefits Our Organization

By incorporating email security monitoring, the organization:

1. Prevents financial fraud by detecting phishing emails targeting employees.
2. Reduces malware infections by flagging suspicious attachments before they are opened.
3. Strengthens customer trust by ensuring secure email communication channels.

Email remains one of the largest attack surfaces for organizations, and by integrating email security monitoring with SIEM, businesses can proactively defend against phishing, spoofing, and malware attacks.

5.5 Impact of Cloud Migration on Security Operations

As discussed in the previous chapter, migrating from an on-prem Wazuh deployment to Wazuh Cloud provided significant operational improvements.

5.5.1 Increased Scalability and Performance

1. Cloud-based security monitoring eliminates storage limitations, allowing for longer log retention periods.
2. System performance improved, enabling real-time event correlation without delays.

5.5.2 Simplified Security Management

2. The cloud platform automates log ingestion, rule updates, and compliance tracking, reducing manual workload.
3. Security alerts are centralized and accessible remotely, improving incident response efficiency.

5.5.3 Cost and Operational Benefits

1. Reduces infrastructure costs by eliminating hardware maintenance and on-prem resource allocation.
2. Ensures high availability with built-in redundancy, minimizing downtime.

5.6 Conclusion

The implementation of Wazuh SIEM for FinTech security demonstrated its ability to:

1. Detect and respond to network threats through real-time event correlation.
2. Automate security actions, reducing manual intervention.
3. Enforce compliance with PCI-DSS and GDPR.
4. Strengthen email security to mitigate phishing and fraud risks.
5. Enhance operational efficiency through cloud-based security monitoring.

This project highlights how a well-configured SIEM can serve as a critical cybersecurity tool for modern financial institutions, ensuring proactive defence, regulatory compliance, and business continuity.

CHAPTER 6

CONCLUSION AND DISCUSSION

This project demonstrated the implementation of Wazuh SIEM as a Security Operations Center (SOC) solution for a FinTech environment, addressing key cybersecurity challenges such as threat detection, compliance enforcement, and email security. By deploying a Windows 11 endpoint, a Kali Linux attacker system, and Wazuh SIEM, we successfully analyzed security threats, automated incident response, and ensured regulatory compliance.

The findings highlight that traditional security measures alone are insufficient in handling modern cyber threats. Real-time log monitoring, automated threat detection, and proactive security mechanisms are essential for organizations handling financial transactions and sensitive customer data. The migration to Wazuh Cloud further improved performance, scalability, and centralized security management, proving its efficiency over on-premise deployments.

From a business perspective, implementing SIEM-based security monitoring reduces the risk of data breaches, financial fraud, and compliance violations. Automated security workflows also reduce analyst workload, allowing organizations to focus on proactive threat mitigation rather than reactive security measures.

In conclusion, this project reinforces the importance of integrating SIEM solutions into cybersecurity strategies, particularly for industries handling sensitive financial operations. Moving forward, organizations should continue exploring cloud-based security solutions, advanced AI-driven threat detection, and automated security orchestration to enhance cyber resilience in an evolving threat landscape.

6.1 Introduction

The rise of digital financial transactions has amplified the need for advanced cybersecurity strategies. FinTech companies handle vast amounts of sensitive customer data, making them prime targets for cyber threats such as data breaches, fraud, and regulatory non-compliance. This project focused on implementing Wazuh SIEM as a Security Operations Center (SOC) solution, aiming to enhance real-time threat detection, automate security responses, and enforce compliance with stringent financial regulations. The system was designed to address key cybersecurity challenges, including email security, unauthorized access, and the limitations of traditional security measures in detecting sophisticated attacks.

6.2 Methodology and System Deployment

To validate the efficiency of Wazuh SIEM in a FinTech environment, we set up an experimental security infrastructure consisting of:

6.2.1 Windows 11 Endpoint: Acted as a monitored system to simulate a real-world business workstation.

6.2.2 Kali Linux Attacker System: Used to generate simulated cyberattacks, testing the effectiveness of the security monitoring capabilities.

6.2.3 Wazuh SIEM Platform: Deployed to collect logs, analyze security threats, and generate alerts based on suspicious activity.

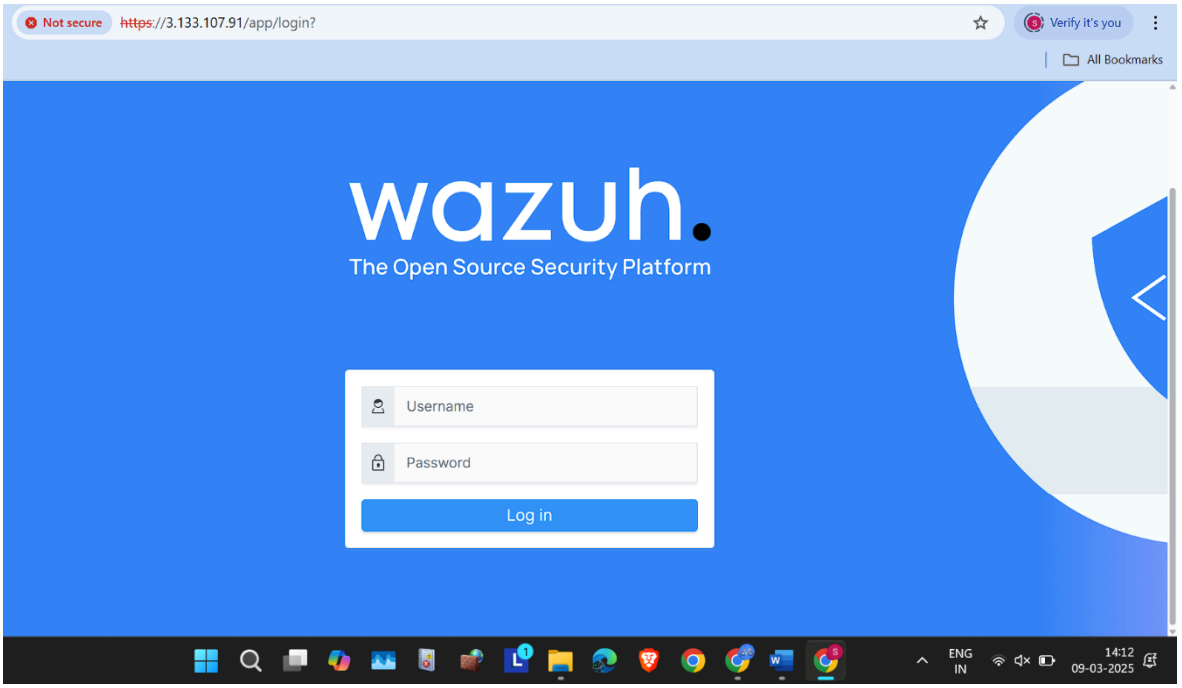

Fig 6.2.1 Connecting to Wazuh Server Dashboard

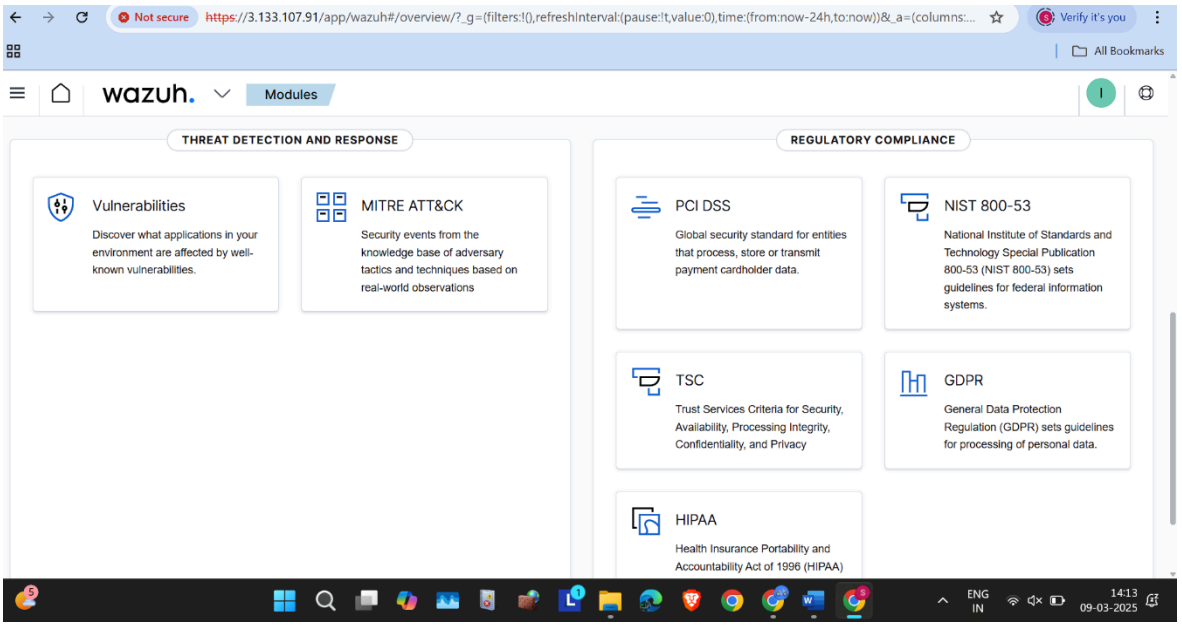

Fig 6.2.2 Threat Detection and Regulatory Compliance Features

Through this setup, we conducted multiple attack simulations, including brute-force attacks, malware injections, and phishing-based exploits. The results demonstrated Wazuh SIEM's capability to detect, analyze, and respond

to security incidents with high accuracy. The automated security policies and correlation rules significantly reduced the time required for incident detection and response, thereby improving overall security posture.

6.3 Key Findings and Performance Insights

One of the most critical insights gained from this project is that traditional security mechanisms alone are insufficient to protect modern financial infrastructures. Organizations operating in the FinTech sector require an advanced security framework that integrates real-time monitoring, proactive threat intelligence, and automated response mechanisms.

A major milestone in this implementation was the migration to **Wazuh Cloud**, which brought substantial improvements over on-premise deployments, including:

6.3.1 Enhanced Performance: Faster processing of security events and improved detection rates.

6.3.2 Scalability: Ability to scale security monitoring without infrastructure limitations.

6.3.3 Centralized Security Management: Unified control over security policies and compliance monitoring across multiple environments.

These benefits reinforce the growing necessity for cloud-based security solutions in financial organizations dealing with large-scale, real-time data transactions.

6.4 Business Impact and Compliance Benefits

From a business perspective, deploying a SIEM-based security framework provides numerous advantages, including:

6.4.1 Reduction of Security Risks: Continuous log monitoring and real-time alerts prevent potential breaches before they escalate into major security incidents.

6.4.2 Financial Protection: Minimizing the risk of fraud and cyberattacks reduces financial losses and protects customer assets.

6.4.3 Regulatory Compliance: Wazuh SIEM enables adherence to financial security standards such as PCI-DSS and GDPR, reducing the likelihood of regulatory penalties.

6.4.4 Operational Efficiency: Automating security workflows reduces analyst workload, allowing security teams to focus on proactive threat mitigation instead of manual threat analysis.

By incorporating automated security policies and AI-driven analytics, organizations can transition from reactive security strategies to a proactive defense approach, significantly improving their overall cyber resilience.

6.5 Conclusion and Future Recommendations

This project highlights the crucial role of SIEM solutions in modern cybersecurity frameworks, particularly for industries handling financial operations and sensitive user data. The successful implementation of Wazuh SIEM has proven its efficiency in monitoring, detecting, and responding to cyber threats while ensuring compliance with regulatory standards.

Moving forward, organizations should explore further advancements in security, including:

6.5.1 AI-Driven Threat Detection: Leveraging artificial intelligence and machine learning for predictive threat analysis.

6.5.2 Automated Security Orchestration: Enhancing incident response with self-healing security mechanisms.

6.5.3 Cloud-Native Security Architectures: Strengthening security by integrating cloud-based solutions with traditional security operations.

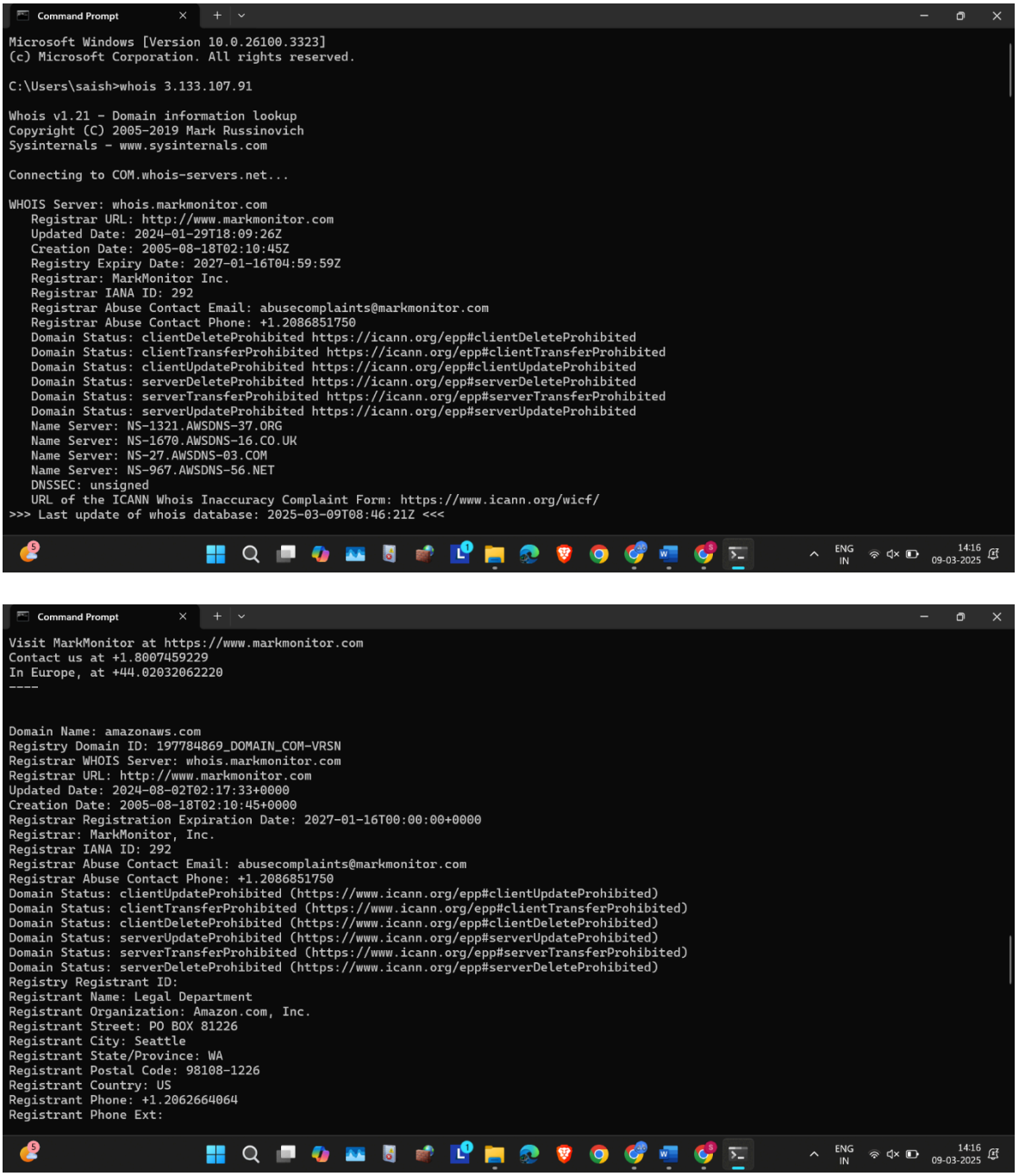

Fig 6.5 Wazuh deployed on cloud (AWS):

As cyber threats continue to evolve, adopting an adaptive, automated, and cloud-driven security strategy is essential for financial organizations to safeguard their digital assets and maintain trust in an increasingly volatile threat landscape.

CHAPTER 7

FUTURE ENHANCEMENTS

As cybersecurity threats continue to evolve, FinTech companies must enhance their security operations by integrating advanced technologies to stay ahead of cybercriminals. This project successfully implemented Wazuh SIEM for threat detection, compliance enforcement, and email security, but further improvements can be made to increase efficiency, automation, and scalability. The following are key areas for future enhancements:

7.1 AI-Powered Threat Detection and Response

The integration of Artificial Intelligence (AI) and Machine Learning (ML) can significantly improve threat detection accuracy and response time. While traditional SIEM systems rely on predefined rules, AI can:

7.1.1 Identify anomalies based on behavioral analysis rather than static rules.
7.1.2 Predict potential cyberattacks by recognizing early indicators of compromise.
7.1.3 Reduce false positives by learning from historical threat patterns.

By integrating AI with Wazuh SIEM, FinTech companies can build a self-learning cybersecurity model, improving incident detection, automated response, and risk assessment.

7.2 FinTech Company's Own Security App with Centralized Controls

Currently, most FinTech companies operate security monitoring through web-based dashboards, limiting accessibility and control. A dedicated mobile and desktop security application can provide:

7.2.1 Real-time security alerts on mobile devices for quick response.
7.2.2 Remote log review and analysis, allowing security teams to investigate threats from anywhere.
7.2.3 One-click mitigation options, enabling administrators to block IPs, quarantine malware, or enforce security policies instantly.

Developing a custom security app will enhance security visibility, accessibility, and operational efficiency, allowing FinTech businesses to monitor their entire security infrastructure from a unified interface.

7.3 Automated Incident Response with SOAR Integration

Security Orchestration, Automation, and Response (SOAR) solutions can further improve incident management by:

7.3.1 Automating threat response workflows based on detected events.
7.3.2 Coordinating across multiple security tools (e.g., SIEM, firewalls, email security).
7.3.3 Providing detailed incident reports with suggested remediation steps.

By integrating SOAR with Wazuh, FinTech companies can reduce manual intervention and respond to threats more efficiently, ensuring faster containment and recovery from cyber incidents.

7.4 Cyber Threat Intelligence (CTI) Integration

Threat intelligence plays a crucial role in modern cybersecurity by providing real-time insights into global cyber threats, enabling organizations to proactively defend against emerging attack vectors. By leveraging Cyber Threat Intelligence (CTI) feeds, security teams can correlate security events with known attack patterns, identify malicious IP addresses, detect harmful domains, and track threat actors in real time. This intelligence-driven approach enhances an organization’s ability to detect, investigate, and respond to threats with greater accuracy before they escalate into critical security incidents.

In this project, Wazuh SIEM is integrated with multiple external CTI sources, such as VirusTotal, IBM X-Force, and MISP, to enrich security event data with real-time threat intelligence feeds. These integrations help identify suspicious files, URLs, and domains, flagging them as potential threats based on global threat databases and historical attack patterns. By continuously analyzing threat intelligence feeds, the system can detect Indicators of Compromise (IOCs) more efficiently, allowing security teams to prevent cyberattacks before they impact business operations.

Furthermore, the project emphasizes automated correlation between threat intelligence feeds and SIEM alerts, reducing false positives and improving incident response workflows. For instance, if a malicious IP is flagged by VirusTotal, Wazuh can automatically trigger an alert, isolate the affected endpoint, and notify security teams for further investigation. This automation minimizes the time required to detect and respond to security incidents, strengthening the overall cybersecurity posture of the organization.

By integrating real-time CTI feeds into Wazuh SIEM, this project demonstrates how threat intelligence enhances proactive defense mechanisms, ensuring that FinTech companies can stay ahead of cyber adversaries, mitigate risks effectively, and maintain regulatory compliance in an ever-evolving threat landscape.

7.5 Unified Threat Detection and Response

Currently, security monitoring often operates in separate silos (e.g., SIEM for log analysis, endpoint security for malware detection, and cloud security for infrastructure monitoring). A unified threat detection and response framework will:

- 7.5.1 Combine network, endpoint, cloud, and email security into a single monitoring system.
- 7.5.2 Improve incident visibility by correlating security events across multiple layers.
- 7.5.3 Enhance response time by triggering automated mitigation actions across different platforms.

By integrating endpoint detection and response (EDR), cloud security, and SIEM into a unified platform, organizations can detect and respond to threats faster while reducing operational complexity.

7.6 Blockchain Security for Transaction Verification

As FinTech companies rely heavily on financial transactions, implementing blockchain security mechanisms can:

- 7.6.1 Enhance transaction integrity by preventing unauthorized modifications.

7.6.2 Provide an immutable audit trail for compliance and fraud prevention.
7.6.3 Secure digital contracts through blockchain-based authentication mechanisms.

Integrating blockchain-based security with SIEM will strengthen transaction security, reducing the risk of fraud and financial manipulation.

7.7 Expanding to Multi-Cloud Security Monitoring

As organizations expand to cloud-based infrastructure, monitoring across multi-cloud environments (AWS, Azure, Google Cloud) becomes essential. Future enhancements can include:

7.7.1 Cross-cloud security analytics, detecting threats across multiple cloud providers.
7.7.2 Cloud workload protection, securing applications and data from cloud-based attacks.
7.7.3 Automated cloud compliance monitoring, ensuring adherence to regulatory standards.

With Wazuh Cloud as a foundation, integrating multi-cloud security capabilities will enable FinTech companies to maintain consistent security monitoring across hybrid environments.

7.8 Conclusion

As cyber threats continue to evolve in sophistication, FinTech companies must adopt advanced security solutions to stay ahead. The enhancements proposed in this chapter—AI integration, a dedicated security app, automated incident response, cyber threat intelligence, unified security monitoring, and blockchain security—can help organizations achieve a more proactive and resilient security posture.

By continuously improving security capabilities, FinTech companies can ensure regulatory compliance, protect customer data, and maintain trust in financial transactions, securing their future against emerging cyber threats.

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