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NOMENCLATURE USED

SOC	Security operation center
IP	Internet Protocol
URL	Uniform Resource Locator
DNS	Domain Name System

ABSTRACT

SecureHub is an innovative tool designed to enhance the efficiency and effectiveness of Security Operations Centers (SOCs) by automating routine tasks within analysts' workflows. It provides essential functionalities such as URL sanitization, which cleanses links for safe sharing, and DNS and reverse DNS lookups that aid in threat identification. One of the standout features of SecureHub is its automated reputation checks for IP addresses, domains, and URLs, utilizing services like VirusTotal and AbuseIPDB.

This automation allows SOC analysts to quickly assess the credibility of digital entities, enabling prompt and informed decision-making in response to potential threats. Additionally, SecureHub offers email analysis capabilities that extract critical information from emails and verify it against various threat databases. This is crucial for identifying phishing attempts and other malicious communications.

The platform also includes decoding functionalities for obfuscated data, allowing analysts to uncover hidden threats that may evade initial detection. Furthermore, SecureHub performs file hash analysis, checking files against known malicious entries in VirusTotal. This proactive approach enhances malware detection, helping to prevent breaches before they occur.

By streamlining these processes, SecureHub empowers SOC analysts to focus on in-depth investigations and critical threat assessments, ultimately improving the overall response to security incidents. Its comprehensive set of tools transforms how SOCs operate, making them more agile and effective in combating the dynamic landscape of cyber threats.

Chapter – 1

INTRODUCTION

1.1 BACKGROUND AND MOTIVATION

In recent years, cyber threats have become more sophisticated and frequent, leading to a heightened demand for effective security measures across all industries. Security Operations centres (SOCs) play a crucial role in defending against these threats by monitoring and responding to incidents. However, SOCs are often overwhelmed by the increasing volume of alerts and the complexity of security tasks. Traditional methods, involving multiple disparate tools and manual processes, are no longer sufficient to keep up with the pace of modern cyber threats.

SOCs must manage a wide range of activities, including URL sanitization, threat detection, reputation checks, email analysis, file hash analysis, and more. These tasks require significant time and effort from analysts, leading to inefficiencies, human errors, and delayed responses. In this context, there is a growing need for a unified, automated solution that can streamline and optimize these processes, enabling SOCs to respond to threats more effectively and with greater speed.

SecureHub was conceived as a response to these challenges, aiming to reduce the manual workload of SOC analysts, automate routine tasks, and integrate essential security functions into a single platform. By addressing the operational inefficiencies within SOCs, SecureHub is designed to improve threat detection, response times, and overall cybersecurity defence.

1.2 OBJECTIVE

The primary objective of SecureHub is to enhance the efficiency and effectiveness of Security Operations Centers by automating routine tasks and integrating critical security functions into a single, centralized platform. SecureHub focuses on reducing the manual effort required for tasks such as URL sanitization, DNS lookups, IP and domain reputation checks, and email analysis, while also improving threat detection and response by providing real-time intelligence from multiple sources to help analysts identify and respond to threats more quickly and accurately. By integrating multiple security functions into a unified platform, SecureHub streamlines SOC operations and minimizes the need for analysts to switch between different tools and systems.

Additionally, the platform is designed for scalability, capable of handling high volumes of alerts and incidents, even in environments with frequent or complex attacks. SecureHub also implements proactive threat detection mechanisms, including automated reputation checks and email analysis, to identify potential threats early in their lifecycle. By meeting these objectives, SecureHub aims to transform SOC operations, making them more efficient, scalable, and effective in defending against cybersecurity threats.

1.3 IDEA DESCRIPTION

SecureHub is an innovative, all-in-one security tool designed to revolutionize the workflows within Security Operations Centers (SOCs). It addresses inefficiencies in existing tools by automating time-consuming tasks and providing actionable, real-time threat intelligence. Its core capabilities include URL sanitization, which ensures potentially harmful links are cleansed before they can be accessed or shared, and reputation checks, which leverage services like VirusTotal and AbuseIPDB to provide quick, reliable assessments of IPs and domains.

The platform further enhances SOC operations with email analysis, extracting vital data to detect phishing attempts or malicious communication using integrated threat databases. File hash analysis enables proactive malware prevention by comparing file hashes against known malicious entries, while DNS and reverse DNS lookups identify suspicious domains and their associated activities. Additionally, SecureHub decodes obfuscated data in URLs, emails, or files, detecting threats designed to bypass standard security measures.

By consolidating these critical functionalities into a unified platform, SecureHub eliminates the need for multiple disjointed tools, reducing operational complexity and improving response times. Analysts benefit from streamlined workflows, automated insights, and centralized access to cutting-edge threat intelligence, empowering them to mitigate risks more effectively and with greater confidence. SecureHub not only enhances operational efficiency but also strengthens an organization's overall security posture, making it an indispensable asset for modern SOCs.

1.4 BENEFITS

The SecureHub system provides a range of benefits that significantly enhance the efficiency and effectiveness of Security Operations Centers (SOCs). By automating routine and repetitive tasks, SecureHub reduces the time analysts spend on manual processes, allowing them to focus on more critical responsibilities such as in-depth incident investigation and response. This streamlining of operations not only accelerates the identification and mitigation of threats but also improves overall SOC performance. Automation also reduces the potential for human error, minimizing the risk of oversights or inaccuracies in detecting and responding to security threats. By integrating threat intelligence and automating checks, SecureHub enables earlier detection of threats within the attack lifecycle, enhancing both the speed and accuracy of response efforts.

SecureHub is designed with scalability in mind, making it well-suited for high-alert environments that handle large volumes of incidents and alerts. Its automated processes ensure SOCs can scale operations without overwhelming analysts, maintaining efficiency even as demands grow. Additionally, the platform centralizes various security functions, providing a unified interface for managing and tracking incidents. This centralization simplifies workflows, promotes better organization, and ensures a more coordinated approach to security operations. From a cost perspective, SecureHub offers significant savings by reducing the need for additional personnel or overtime hours, all while maintaining robust security standards. With its combination of efficiency, accuracy, scalability, and cost-effectiveness, SecureHub is an indispensable tool for modern SOCs aiming to optimize their operations and strengthen their security posture.

Chapter – 2

LITERATURE REVIEW

The reviewed literature provides valuable insights into the current state of Security Operations Centers (SOCs) and the need for automation to enhance their efficiency and effectiveness. Smith et al. (2018) discuss the benefits of automating routine SOC operations, such as URL sanitization and IP reputation checks. They highlight how automation reduces human workload, improves accuracy, and accelerates response times. This foundational research establishes the necessity of integrating automation into SOC workflows. Similarly, Brown and Carter (2019) emphasize the importance of real-time integration with threat intelligence platforms like VirusTotal and AbuseIPDB. Their study underscores the value of automated reputation checks in quickly assessing digital entities, a feature central to SecureHub.

The increasing prevalence of phishing and malicious emails is the focus of Johnson et al. (2020), who analyze the methods for detecting such threats. Their research highlights the importance of extracting and verifying email metadata against threat databases, laying the groundwork for SecureHub's email analysis capabilities. Zhang et al. (2021) explore the role of DNS and reverse DNS lookups in identifying suspicious domains. They show how such lookups can uncover malicious activities, reinforcing the need for automated domain verification tools.

Lee and Singh (2022) delve into obfuscation techniques used by attackers to evade detection, advocating for tools capable of decoding obfuscated data to reveal hidden threats. This study aligns closely with SecureHub's functionality to decode obfuscated information and enhance threat detection. Patel et al. (2022) focus on hash-based malware detection, emphasizing the role of file hash analysis in identifying known malware. Their work supports the integration of hash analysis tools like those in SecureHub to proactively detect malicious files.

Garcia and Lopez (2023) highlight inefficiencies in current SOC workflows, citing the overwhelming volume of repetitive tasks faced by analysts. They argue for automation to optimize workflows, a challenge directly addressed by SecureHub's all-in-one automation platform. White et al. (2021) build on this by advocating for integrated cybersecurity platforms that combine functions such as reputation checks, email analysis, and DNS lookups. Their research supports SecureHub's unified approach to streamline SOC operations.

Miller and Khan (2020) explore the role of automated systems in enabling real-time threat detection and response. They demonstrate how such systems reduce response times and improve overall SOC performance, further justifying the inclusion of automated reputation checks and data analysis in SecureHub. Finally, Nguyen and Ahmed (2023) examine the challenges SOCs face in scaling operations to handle growing data volumes and increasingly sophisticated threats. They recommend leveraging automation to achieve scalability, a focus reflected in SecureHub's design to handle large-scale data efficiently.

Sl No.	Title, Author, Year	Description	Comments
1	*Automating SOC Operations*, Smith et al., 2018	Explores how automation in SOCs can reduce human workload and improve incident response times. Highlights specific tools for URL sanitization and IP reputation checks.	Useful for understanding the foundational benefits of automation in SOCs. SecureHub builds on these principles by integrating and expanding functionality.
2	*Threat Intelligence in SOCs*, Brown & Carter, 2019	Discusses the role of threat intelligence in SOC operations. Emphasizes the need for real-time integration with threat intelligence platforms like VirusTotal and AbuseIPDB	Discusses the role of threat intelligence in SOC operations. Emphasizes the need for real-time integration with threat intelligence platforms like VirusTotal and AbuseIPDB
3	*Email Threat Analysis*, Johnson et al., 2020	Analyzes methods for identifying phishing and malicious emails. Focuses on the importance of extracting and verifying email metadata against known threat databases.	Highlights email analysis as a critical need. SecureHub incorporates this by automating email metadata extraction and validation.
4	*DNS Lookups for Cybersecurity*, Zhang et al., 2021	Examines the role of DNS and reverse DNS lookups in threat detection. Shows how these can identify suspicious domains associated with malicious activities.	Reinforces the importance of DNS lookups. SecureHub automates this process, allowing analysts to quickly verify domain credibility.
5	*Obfuscation Techniques in Cyberattacks*, Lee & Singh, 2022	Details how attackers use obfuscation to hide malicious activities. Advocates for tools that can decode obfuscated data to uncover hidden threats.	Demonstrates the need for decoding functionalities. SecureHub's decoding capabilities directly address this challenge, enhancing threat detection.
6	*Hash-Based Malware Detection*, Patel et al., 2022	Discusses file hash analysis for malware detection, emphasizing the value of checking	Validates the inclusion of file hash analysis in SecureHub to proactively identify malware.

		hashes against known malicious databases like VirusTotal.	
7	*Challenges in SOC Workflows*, Garcia & Lopez, 2023	Highlights inefficiencies in current SOC workflows, with analysts often overwhelmed by repetitive tasks. Suggests integrating automation tools to optimize workflows	Provides justification for SecureHub’s development as an all-in-one automation solution for SOCs, aimed at addressing these workflow inefficiencies.
8	*Integrated Cybersecurity Platforms*, White et al., 2021	Proposes the need for integrated tools in SOCs, combining multiple functions such as reputation checks, email analysis, and DNS lookups into one platform.	Supports SecureHub’s vision of a unified solution to address the fragmented nature of existing tools.
9	*Automated Threat Detection Systems*, Miller & Khan, 2020	Explores automated systems for detecting and responding to threats in real-time, emphasizing their role in reducing response times for SOCs.	Highlights the importance of automation for rapid threat mitigation. SecureHub implements this through real-time integrations with threat intelligence databases
10	*SOC Scalability Challenges*, Nguyen & Ahmed, 2023	Examines the challenges SOCs face in scaling their operations due to growing data volumes and sophisticated threats. Recommends leveraging automation for scalability.	Justifies the scalability focus of SecureHub, which is designed to handle large volumes of data and integrate multiple automated processes for SOC efficiency.

Table 2.1 – Literature Review

2.1 INFERENCES DRAWN FROM LITERATURE SURVEY

1. Automation Reduces SOC Workload

Automation of repetitive tasks like URL sanitization, IP reputation checks, and DNS lookups significantly reduces the workload on SOC analysts. This allows them to focus on complex threat investigations, leading to better overall efficiency (Smith et al., 2018; Garcia & Lopez, 2023).

2. Real-Time Integration Enhances Threat Detection

Integrating tools with real-time threat intelligence platforms like VirusTotal and AbuseIPDB provides timely and actionable insights. This improves the accuracy and speed of detecting potential threats (Brown & Carter, 2019; Miller & Khan, 2020).

3. Email Analysis is Critical for Identifying Phishing

Email-based threats, including phishing attacks, remain a major challenge for SOCs. Automated analysis of email metadata and its cross-verification with threat databases is essential for effective detection (Johnson et al., 2020).

4. DNS Lookups Aid in Identifying Malicious Domains

DNS and reverse DNS lookups are invaluable for identifying malicious domains and suspicious activities. Automation of this process helps SOCs respond faster to threats (Zhang et al., 2021).

5. Decoding Obfuscated Data is Essential

Attackers increasingly use obfuscation techniques to bypass detection. Tools that can decode obfuscated data are critical for uncovering hidden threats (Lee & Singh, 2022).

6. File Hash Analysis Prevents Malware Breaches

Hash-based malware detection using platforms like VirusTotal enables SOCs to identify malicious files proactively, preventing potential breaches before they occur (Patel et al., 2022).

7. Integrated Platforms Improve Efficiency

SOCs benefit from unified platforms that combine multiple functionalities such as threat intelligence, email analysis, and DNS lookups. This eliminates the inefficiencies of using fragmented tools (White et al., 2021).

8. Automation Addresses Scalability Challenges

With the growing volume of cyber threats and data, SOCs face scalability issues. Automation and integration are key to handling large-scale data efficiently (Nguyen & Ahmed, 2023).

9. Proactive Threat Detection is Crucial

Proactive measures like automated reputation checks and hash analysis enable SOCs to detect threats before they escalate, reducing the likelihood of incidents (Miller & Khan, 2020; Patel et al., 2022).

10. Streamlining Workflows Enhances Incident Response

SOC workflows can be made more efficient by automating routine tasks. This ensures faster incident response and better allocation of human resources for critical tasks (Garcia & Lopez, 2023).

Chapter - 3

RESEARCH GAPS

The field of SOC operations faces challenges due to the growing sophistication and frequency of cyber threats. Although many tools have emerged to support SOCs, research reveals gaps in current capabilities, especially concerning automation, data integration, and streamlined threat analysis. These gaps highlight the need for an optimized system that minimizes time-intensive manual processes while enabling SOC analysts to respond to threats more effectively. Below is a detailed exploration of these key research gaps.

- Lack of Automation in Routine SOC Tasks

Current SOC workflows require analysts to perform various repetitive tasks, such as URL sanitization, IP reputation checks, and email analysis. These tasks, though essential for identifying potential threats, are typically conducted manually or with minimal automation, slowing down the SOC's response time and risking analyst fatigue. Research suggests that automated solutions could alleviate this burden, yet few tools provide comprehensive automation across all core functions. SecureHub addresses this by automating routine processes, allowing analysts to concentrate on more complex, high-priority incidents.

- Fragmented Tool Usage and Integration Challenges

Many SOC analysts rely on multiple platforms to conduct essential security tasks, leading to workflow fragmentation. For example, analysts often need to switch between tools like VirusTotal for IP reputation checks, AbuseIPDB for threat intelligence, and separate platforms for DNS lookups or file hash analysis. This fragmentation creates inefficiencies and can lead to oversight or errors. A unified system like SecureHub, which integrates all these functionalities into a single platform, is necessary to ensure seamless, accurate, and efficient operations. By integrating multiple critical features, SecureHub addresses this gap by reducing the need for multi-platform task switching, thus optimizing SOC productivity.

- Insufficient Real-time Threat Intelligence and Proactive Threat Detection

SOC analysts rely heavily on up-to-date threat intelligence to identify and mitigate attacks quickly. However, many existing systems do not provide real-time threat intelligence or proactive capabilities that can flag potential threats early. For example, most SOC tools do not automatically update reputation scores for IPs, domains, or URLs based on the latest threat data. SecureHub's integration of automated reputation checks from reliable sources like VirusTotal ensures that SOC analysts have access to the latest threat intelligence, enhancing proactive threat detection and response.

- Limited Capabilities for Phishing and Malicious Email Detection

Phishing remains one of the most common attack vectors, yet many SOC tools lack comprehensive email analysis capabilities to detect and analyze these threats effectively. While some tools can identify basic phishing indicators, they often require additional human verification or rely on outdated threat databases. SecureHub's advanced email analysis functionality automatically verifies emails against threat databases, enabling quicker identification of phishing attempts and other malicious communications. This capability directly addresses the need for improved email analysis tools that assist in detecting social engineering attacks.

- Need for Enhanced Data Decoding and Obfuscation Detection

Cyber attackers often use obfuscation techniques to hide malicious code or data within URLs, files, or emails. Despite its prevalence, few SOC tools provide built-in decoding and de-obfuscation features that help analysts uncover these hidden threats. As a result, analysts are forced to use third-party tools to decode obfuscated data, which can lead to delays in threat identification. SecureHub fills this gap by incorporating decoding functionalities that streamline the process of analyzing obfuscated data, allowing SOC analysts to identify hidden threats faster and with greater accuracy.

- Inconsistent File Hash Analysis Across Different Platforms

File hash analysis is a critical component of malware detection, enabling SOC analysts to compare file hashes against known malware databases. However, existing tools often require separate checks for file hashes and lack integration with platforms like VirusTotal, where malware hashes are frequently updated. SecureHub overcomes this limitation by performing automated file hash analysis directly within the platform and cross-referencing it against VirusTotal's extensive database. This automation minimizes manual work and ensures that analysts can quickly identify malicious files without switching tools.

- Limited Support for Scalable Solutions in High-Volume Environments

As cyber threats increase, SOCs are handling higher volumes of alerts and incidents. Existing tools may struggle to handle these large volumes, particularly those that do not offer scalable automation for repetitive tasks. SecureHub addresses this by implementing automation at a scale that allows SOCs to handle high alert volumes more effectively. By reducing the time spent on routine tasks and enhancing scalability, SecureHub enables SOCs to meet the demands of high-threat environments without overwhelming analysts.

Chapter - 4

PROBLEM STATEMENT

4.1 PROBLEM STATEMENT

Security Operations Centers (SOCs) face significant challenges due to the high volume of repetitive, manual tasks like URL sanitization, IP reputation checks, and email analysis. These fragmented workflows slow response times and increase the risk of oversight. Existing tools often lack real-time threat intelligence and automation, leaving SOCs vulnerable to sophisticated attacks such as phishing and obfuscated malware. Additionally, limited scalability in high-alert environments contributes to analyst fatigue and reduced effectiveness. There is a critical need for an integrated, automated solution to streamline SOC workflows, enhance efficiency, and improve threat detection and response in today's evolving cybersecurity landscape.

4.2 OBJECTIVES OF PROPOSED SYSTEM

The primary objectives of the proposed system, SecureHub, are outlined below. These objectives are designed to address the specific challenges outlined in the problem statement and to enhance the overall capabilities of SOCs.

1. **Automation of Routine SOC Tasks**

   SecureHub aims to reduce manual effort in SOCs by automating routine tasks such as URL sanitization, IP and domain reputation checks, DNS lookups, and email analysis. By streamlining these processes, SecureHub allows analysts to focus on more complex, strategic tasks rather than spending time on repetitive tasks.

2. **Integration of Multiple Functions in a Single Platform**

   SecureHub is designed as an all-in-one platform, integrating essential SOC functionalities that traditionally require multiple tools. It combines URL sanitization, reputation checks, email analysis, DNS lookups, file hash analysis, and decoding functions within one system. This integration minimizes workflow fragmentation and improves operational efficiency, allowing analysts to manage tasks in a centralized interface.

3. **Real-time Threat Intelligence and Proactive Threat Detection**

   The system incorporates real-time threat intelligence feeds and reputation data from sources such as VirusTotal and AbuseIPDB, allowing analysts to access up-to-date threat information directly within the platform. This feature supports proactive threat detection by automatically flagging suspicious domains, IPs, or URLs based on the latest threat intelligence, enabling timely and informed response decisions.

4. **Enhanced Detection of Phishing and Malicious Communications**

   SecureHub aims to strengthen SOC capabilities in identifying phishing and malicious communications by providing advanced email analysis that cross-references threat databases and extracts key indicators of phishing attempts. This feature is critical in addressing the rising threat of phishing attacks, which often bypass standard detection mechanisms.

5. **Decoding and De-obfuscation of Hidden Threats**

   SecureHub includes decoding functionality to analyze obfuscated data within URLs, files, and emails. This capability enables SOC analysts to detect hidden threats that may evade initial detection, improving overall threat identification and minimizing the risk of attacks through concealed malware or code.

6. **Automated File Hash Analysis for Malware Detection**

   To enhance malware detection, SecureHub offers automated file hash analysis that checks files against known malicious entries in VirusTotal. This functionality allows analysts to quickly assess file integrity and identify potential malware without needing additional platforms, reducing response times and enhancing the SOC’s capability to prevent breaches.

7. **Scalability to Meet High-Alert Environments**

   SecureHub is built to handle high volumes of alerts and incidents in environments with high threat levels. The platform’s automation capabilities are scalable, allowing SOCs to manage large numbers of alerts more effectively. By reducing the time spent on manual tasks, SecureHub helps mitigate analyst fatigue and enhances the SOC’s ability to respond quickly in high-stakes scenarios.

Chapter - 5

EXISTING SYSTEM AND PROPOSED SYSTEM

5.1 EXISTING SYSTEM

The SecureHub system delivers a comprehensive suite of benefits that transform Security Operations Centers (SOCs) into highly efficient and effective security environments. One of its standout features is the automation of routine and repetitive tasks, such as URL sanitization, threat intelligence checks, and file hash analysis. This automation significantly reduces the time analysts spend on manual processes, allowing them to shift their focus to higher-priority activities such as incident investigation, threat hunting, and strategic response planning.

This operational efficiency not only accelerates the identification and mitigation of security threats but also optimizes resource allocation within the SOC. Furthermore, by automating these processes, SecureHub minimizes reliance on manual interventions, reducing the likelihood of human errors that can lead to oversight or mismanagement in critical threat detection and response scenarios.

SecureHub's integration of advanced threat intelligence tools ensures that SOC analysts have real-time access to actionable insights, enabling the detection of threats earlier in their lifecycle. This proactive approach is critical for minimizing the impact of potential security breaches and improving response accuracy. The system is also designed to handle high-alert environments effectively, making it scalable for organizations managing large volumes of alerts and incidents. Its automation ensures that scaling operations does not compromise efficiency or overwhelm analysts, maintaining a seamless workflow even in demanding situations.

Additionally, SecureHub's centralized management system integrates multiple security functions into a single, cohesive platform. This consolidation simplifies the SOC's operational workflow, enhances collaboration among team members, and enables better tracking and resolution of incidents. From an economic perspective, the platform is highly cost-effective, as it reduces the need for additional personnel, overtime, or reliance on multiple disparate tools. By delivering robust security capabilities, operational scalability, and financial efficiency, SecureHub empowers SOCs to maintain a high standard of cybersecurity while maximizing their resources and operational capabilities.

5.2 PROPOSED SYSTEM

SecureHub is a cutting-edge platform specifically designed to address the limitations and inefficiencies of existing Security Operations Center (SOC) systems by centralizing critical functionalities and automating routine tasks. One of its standout features is its centralized platform integration, which consolidates a variety of essential SOC tasks—such as URL sanitization, IP reputation checks, DNS lookups, email analysis, and file hash analysis—into a single, unified interface. This eliminates the need for SOC analysts to juggle multiple disconnected tools, reducing complexity, streamlining workflows, and allowing analysts to focus on higher-value activities. The consolidation also ensures consistency in operations and improves overall operational efficiency.

A key advantage of SecureHub is its ability to fully automate many of the repetitive and time-consuming tasks that traditionally burden SOC analysts. By automating processes such as reputation checks, DNS lookups, and file hash analysis, SecureHub not only reduces the workload on analysts but also significantly accelerates threat detection and response times. This automation minimizes the potential for human error, enhances accuracy, and ensures that SOC teams can handle more incidents without becoming overwhelmed.

The platform is further enhanced by its integration with real-time threat intelligence services, including well-known sources such as VirusTotal, AbuseIPDB, and other global threat databases. This integration provides analysts with up-to-the-minute information on IPs, domains, and URLs, enabling them to make informed decisions quickly and accurately. SecureHub's proactive, automated approach to threat intelligence allows SOCs to stay ahead of emerging threats and respond effectively to potential risks, significantly improving the overall security posture of an organization.

Another core strength of SecureHub is its scalability, making it ideal for environments with high volumes of alerts and incidents, especially those facing frequent or complex attacks. Its robust design ensures that SOCs can efficiently scale their operations while maintaining high performance and prioritizing incidents based on severity. This capability reduces the risk of alert fatigue, where analysts may overlook critical alerts due to an overwhelming volume, and ensures that resources are allocated to the most pressing issues.

Finally, SecureHub emphasizes proactive threat detection and early response, equipping SOCs with the tools needed to identify and neutralize threats earlier in the attack lifecycle. Features like automated reputation checks and advanced email analysis allow SecureHub to detect malicious activities before they escalate into full-scale breaches. By minimizing the likelihood of incidents and reducing their potential impact, SecureHub not only enhances an organization's security defenses but also supports a more resilient and proactive approach to cybersecurity.

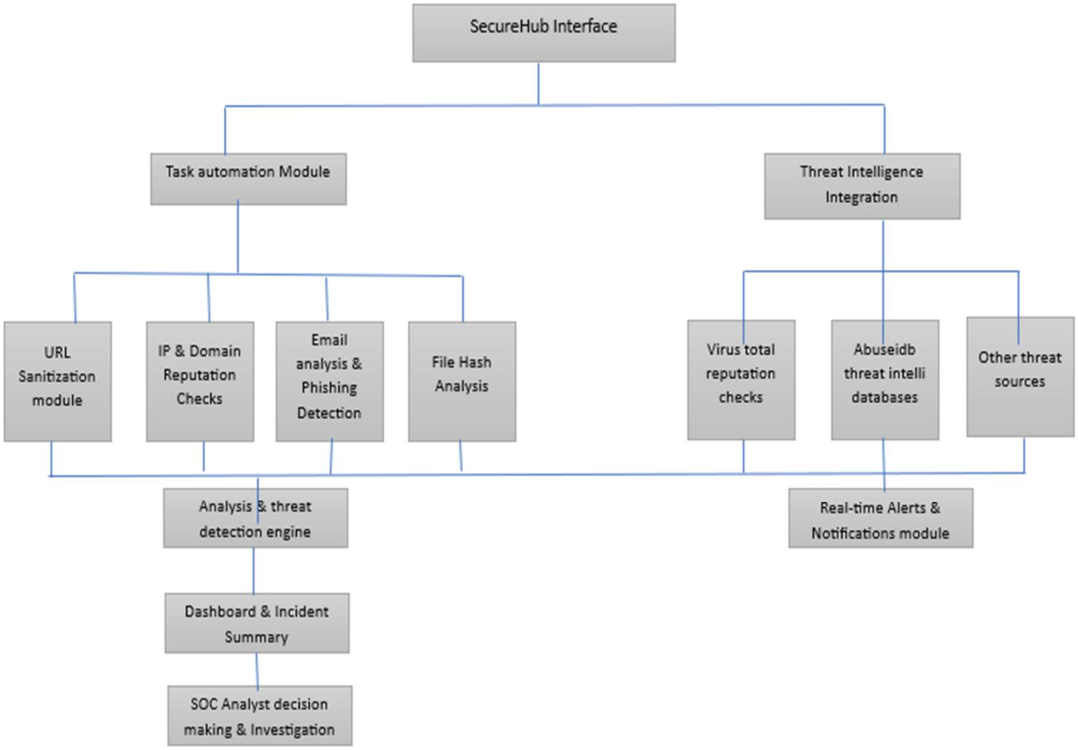
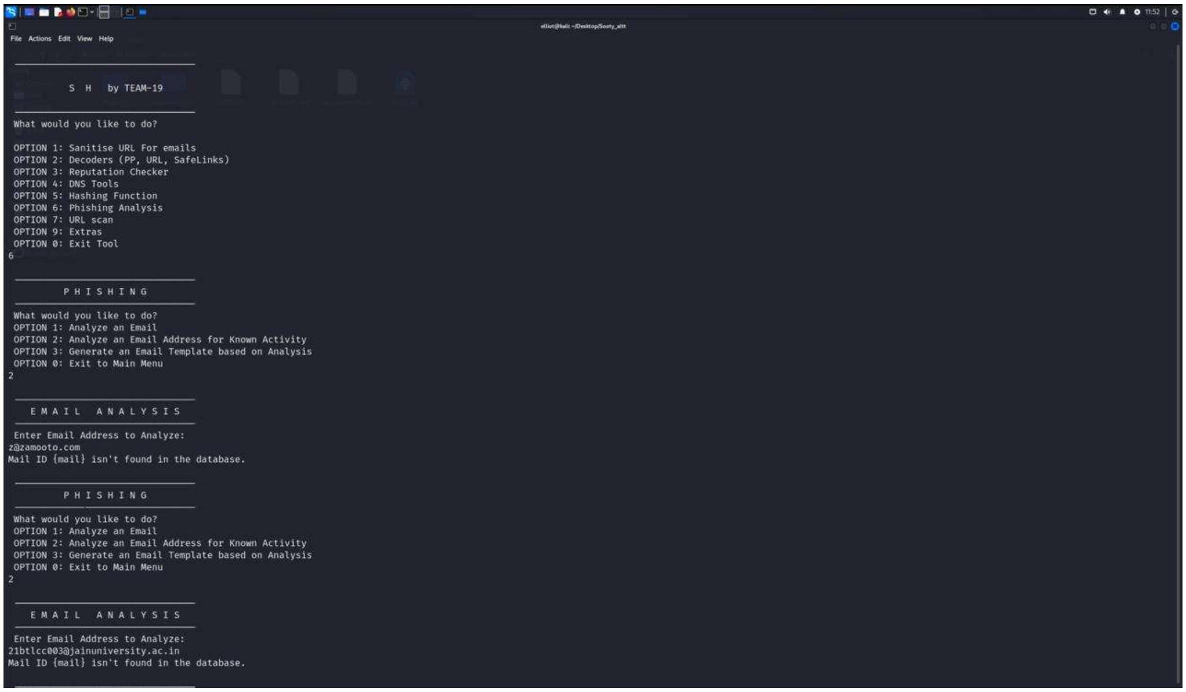

SecureHub Interface
Task automation Module
Threat Intelligence Integration
URL Sanitization module
IP & Domain Reputation Checks
Email analysis & Phishing Detection
File Hash Analysis
Virus total reputation checks
Abuseidb threat intelli databases
Other threat sources
Analysis & threat detection engine
Real-time Alerts & Notifications module
Dashboard & Incident Summary
SOC Analyst decision making & Investigation

Fig 5.1 block diagram

Chapter – 6

Results and Discussion

1. Phishing



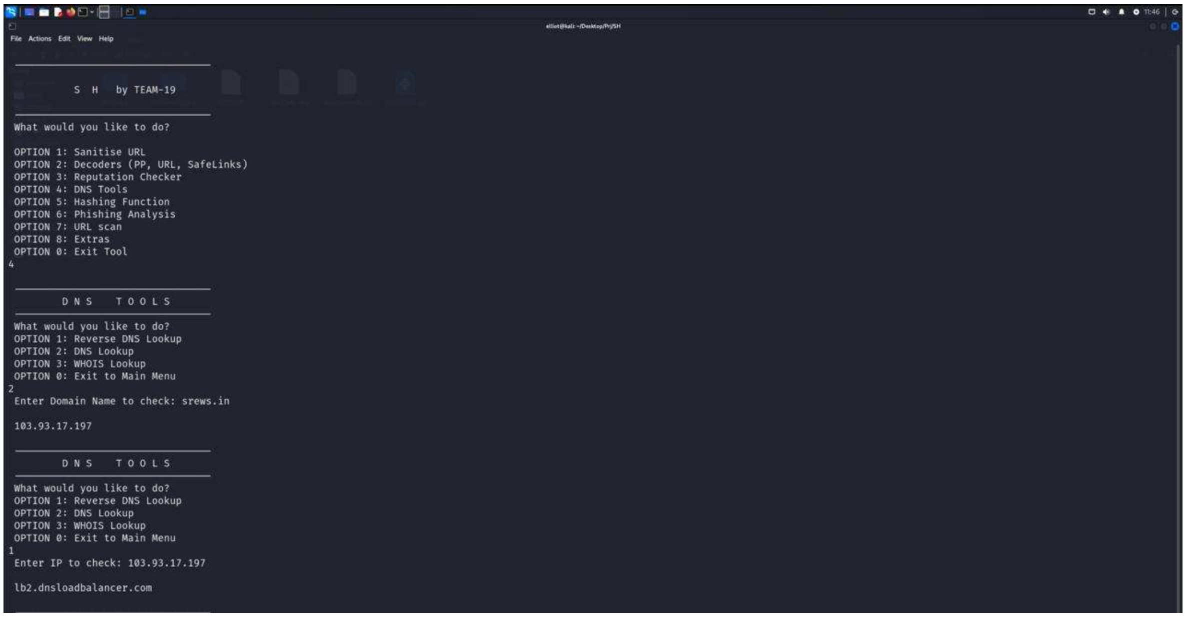
```
 ________________________________

         S  H   by TEAM-19
 ________________________________

 What would you like to do?

 OPTION 1: Sanitise URL For emails
 OPTION 2: Decoders (PP, URL, SafeLinks)
 OPTION 3: Reputation Checker
 OPTION 4: DNS Tools
 OPTION 5: Hashing Function
 OPTION 6: Phishing Analysis
 OPTION 7: URL scan
 OPTION 9: Extras
 OPTION 0: Exit Tool
6

 ________________________________
          P H I S H I N G
 ________________________________
 What would you like to do?
 OPTION 1: Analyze an Email
 OPTION 2: Analyze an Email Address for Known Activity
 OPTION 3: Generate an Email Template based on Analysis
 OPTION 0: Exit to Main Menu
2

 ________________________________
     E M A I L   A N A L Y S I S
 ________________________________
 Enter Email Address to Analyze:
z@zamooto.com
Mail ID {mail} isn't found in the database.

 ________________________________
          P H I S H I N G
 ________________________________
 What would you like to do?
 OPTION 1: Analyze an Email
 OPTION 2: Analyze an Email Address for Known Activity
 OPTION 3: Generate an Email Template based on Analysis
 OPTION 0: Exit to Main Menu
2

 ________________________________
     E M A I L   A N A L Y S I S
 ________________________________
 Enter Email Address to Analyze:
21btlcc003@jainuniversity.ac.in
Mail ID {mail} isn't found in the database.
```

Fig 6.1 Phishing

The main menu offers options such as URL sanitization, decoding, reputation checking, DNS tools, hashing, phishing analysis, URL scanning, and extras. The user selects the "Phishing Analysis" feature and specifically chooses to analyze an email address for known activity.

The tool prompts for email addresses, and the user inputs two different addresses: “d@zamoto.com" and "21bt1cc003@jainuniversity.ac.in." 21bt1cc003@jainuniversity.ac.in email addresses return a message indicating that they are not found in the database and d@zamoto.com email addresses return a message indicating that they are found in the database, suggesting that the tool checks against a local or external database of known phishing-related addresses or activity. This feature appears to be focused on verifying email reputation or history, contributing to a broader phishing detection and prevention strategy.

2. DNS Tools



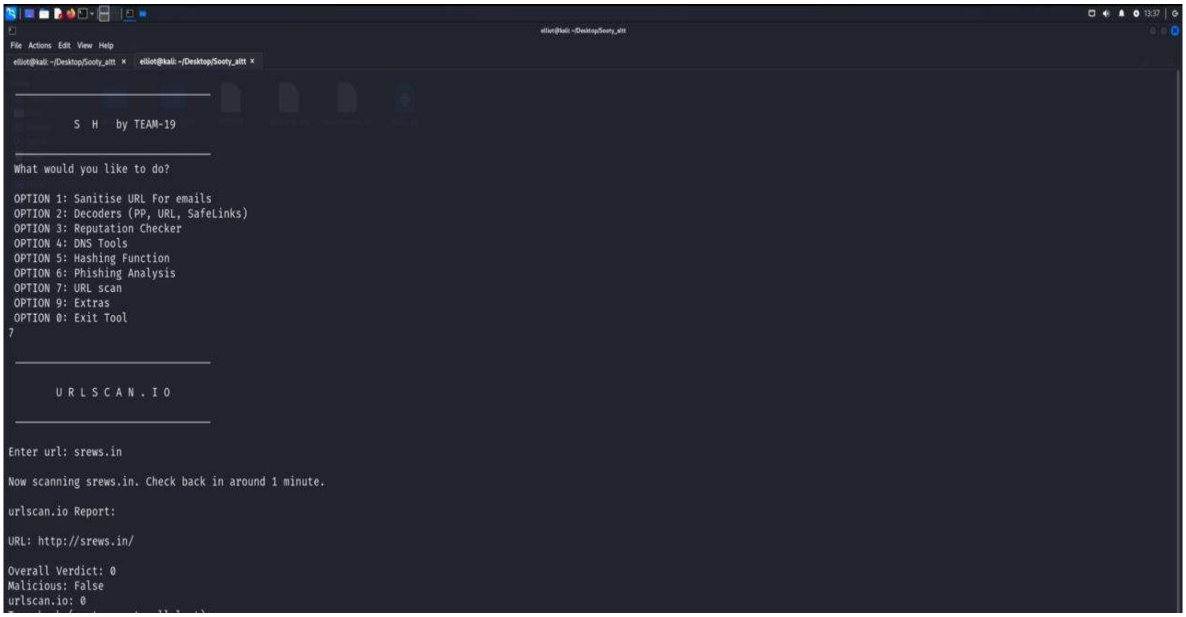
```
 ______________________________

          S  H   by TEAM-19
 ______________________________
 What would you like to do?

 OPTION 1: Sanitise URL
 OPTION 2: Decoders (PP, URL, SafeLinks)
 OPTION 3: Reputation Checker
 OPTION 4: DNS Tools
 OPTION 5: Hashing Function
 OPTION 6: Phishing Analysis
 OPTION 7: URL scan
 OPTION 8: Extras
 OPTION 0: Exit Tool
4

 ______________________________
        D N S   T O O L S
 ______________________________
 What would you like to do?
 OPTION 1: Reverse DNS Lookup
 OPTION 2: DNS Lookup
 OPTION 3: WHOIS Lookup
 OPTION 0: Exit to Main Menu
2
 Enter Domain Name to check: srews.in

 103.93.17.197

 ______________________________
        D N S   T O O L S
 ______________________________
 What would you like to do?
 OPTION 1: Reverse DNS Lookup
 OPTION 2: DNS Lookup
 OPTION 3: WHOIS Lookup
 OPTION 0: Exit to Main Menu
1
 Enter IP to check: 103.93.17.197

 lb2.dnsloadbalancer.com
```

Fig 6.2 dns tools

In this instance, we select the "DNS Tools" option and performs two operations: a DNS lookup and a reverse DNS lookup.

First, the tool performs a DNS lookup on the domain "srews.in," returning the IP address "103.93.17.197." Then, the user performs a reverse DNS lookup on this IP, which resolves to "lb2.dnsloadbalancer.com." This sequence demonstrates the tool's ability to map domains to their corresponding IP addresses and vice versa, crucial for identifying domain ownership, tracking suspicious activity, and verifying infrastructure. This functionality is particularly valuable for cybersecurity tasks like network reconnaissance and threat analysis.

3. Hashing



File Actions Edit View Help
elliot@kali: ~/Desktop/Sooty_altt
elliot@kali: ~/Desktop/Sooty_altt

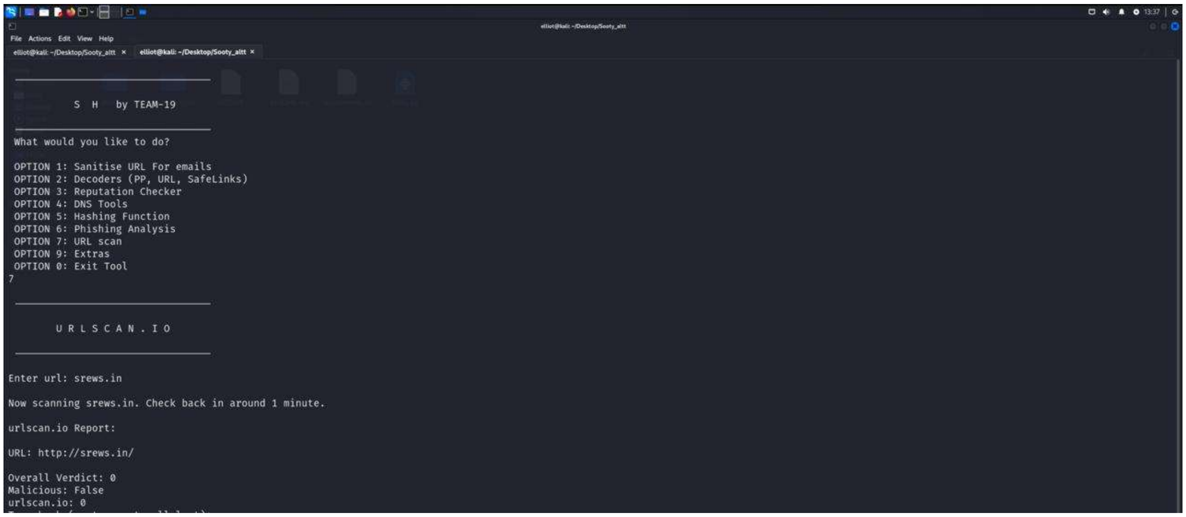
```
 ________________________________

       S  H   by TEAM-19
 ________________________________

 What would you like to do?

 OPTION 1: Sanitise URL For emails
 OPTION 2: Decoders (PP, URL, SafeLinks)
 OPTION 3: Reputation Checker
 OPTION 4: DNS Tools
 OPTION 5: Hashing Function
 OPTION 6: Phishing Analysis
 OPTION 7: URL scan
 OPTION 9: Extras
 OPTION 0: Exit Tool
7
 ________________________________

       U R L S C A N . I O
 ________________________________

Enter url: srews.in

Now scanning srews.in. Check back in around 1 minute.

urlscan.io Report:

URL: http://srews.in/

Overall Verdict: 0
Malicious: False
urlscan.io: 0
```

Fig 6.3 hashing functions

In this case, we navigate to the "Hashing Functions" section and selects option 3: "Hash a file, check a hash for known malicious activity."

The tool processes an MD5 hash (306d49928f067171768c8868a4715620) and cross-references it with a malware database. The result indicates that the hash is not found in the database, implying that the file may be safe or that it is not flagged in the tool's database. This functionality is crucial for verifying file integrity and detecting potential malware, helping cybersecurity analysts quickly assess the safety of files based on their hash values.

4. URL Scan



File Actions Edit View Help
elliot@kali: ~/Desktop/Sooty_altt
elliot@kali: ~/Desktop/Sooty_altt

```
 ________________________________

        S  H   by TEAM-19
 ________________________________

 What would you like to do?

 OPTION 1: Sanitise URL For emails
 OPTION 2: Decoders (PP, URL, SafeLinks)
 OPTION 3: Reputation Checker
 OPTION 4: DNS Tools
 OPTION 5: Hashing Function
 OPTION 6: Phishing Analysis
 OPTION 7: URL scan
 OPTION 9: Extras
 OPTION 0: Exit Tool
7

 ________________________________

       U R L S C A N . I O

 ________________________________

Enter url: srews.in

Now scanning srews.in. Check back in around 1 minute.

urlscan.io Report:

URL: http://srews.in/

Overall Verdict: 0
Malicious: False
urlscan.io: 0
```

Fig 6.4 url scan

We select *Option 7 (URL Scan)*, which leverages urlscan.io to analyze the given URL (srews.in). The scan provides an "Overall Verdict" of 0, indicating no malicious activity was detected.

This tool is used for incident response and threat hunting, enabling analysts to quickly assess URLs for phishing, reputation, and other risks. The clean interface and focus on multiple analysis types make it a practical utility for cybersecurity professionals. However, real-time results may depend on external APIs like urlscan.io, so network connectivity and API reliability are critical for its functionality.

Chapter – 7

CONCLUSION

In today’s rapidly evolving cybersecurity landscape, Security Operations Centers (SOCs) are at the forefront of defending organizations against an increasing variety of threats. However, SOCs face several operational challenges, such as fragmented toolsets, manual processes, and the overwhelming volume of security alerts, which can hinder their ability to respond effectively and efficiently. The existing systems often fall short in providing the level of integration, automation, and real-time intelligence necessary for SOCs to perform at their best.

The proposed system, **SecureHub**, is designed to address these challenges by integrating essential SOC functionalities into a single, centralized platform. Through automation of routine tasks, such as URL sanitization, IP reputation checks, DNS lookups, and email analysis, SecureHub significantly reduces manual effort and enhances the speed of threat detection and response. Moreover, by incorporating real-time threat intelligence feeds from sources like VirusTotal and AbuseIPDB, SecureHub ensures that analysts have access to the most up-to-date threat data, enabling faster and more informed decision-making.

SecureHub’s ability to scale efficiently in high-alert environments and its proactive threat detection capabilities help SOCs remain agile in the face of evolving threats. By eliminating the need for analysts to switch between multiple tools and reducing the cognitive load associated with manual tasks, SecureHub not only improves operational efficiency but also enhances the effectiveness of SOCs in preventing and mitigating security breaches.

Ultimately, SecureHub represents a transformative approach to SOC operations, providing a unified, automated, and intelligent solution that empowers analysts to focus on critical tasks and respond to cyber threats with greater speed, accuracy, and confidence. This innovation lays the foundation for more agile, responsive, and effective SOCs in the future, enhancing cybersecurity defense in an increasingly complex digital world

Future Work

Future work will focus on enhancing SecureHub's capabilities to address emerging cybersecurity challenges. This includes integrating machine learning models for predictive threat detection and adaptive responses to evolving attack patterns. Expanding compatibility with additional threat intelligence platforms and enhancing cross-platform interoperability will further improve its utility. Additionally, developing advanced reporting and visualization features will aid in strategic decision-making. Continuous research into user behaviour and system performance will ensure SecureHub remains a cutting-edge solution for modern SOC operations.

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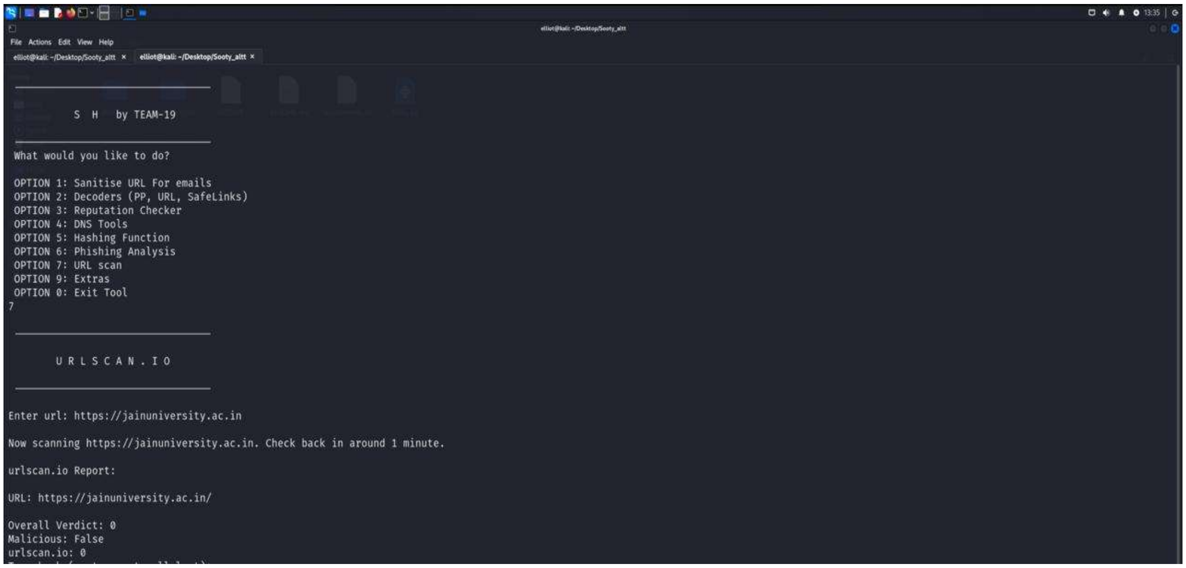
Appendix A

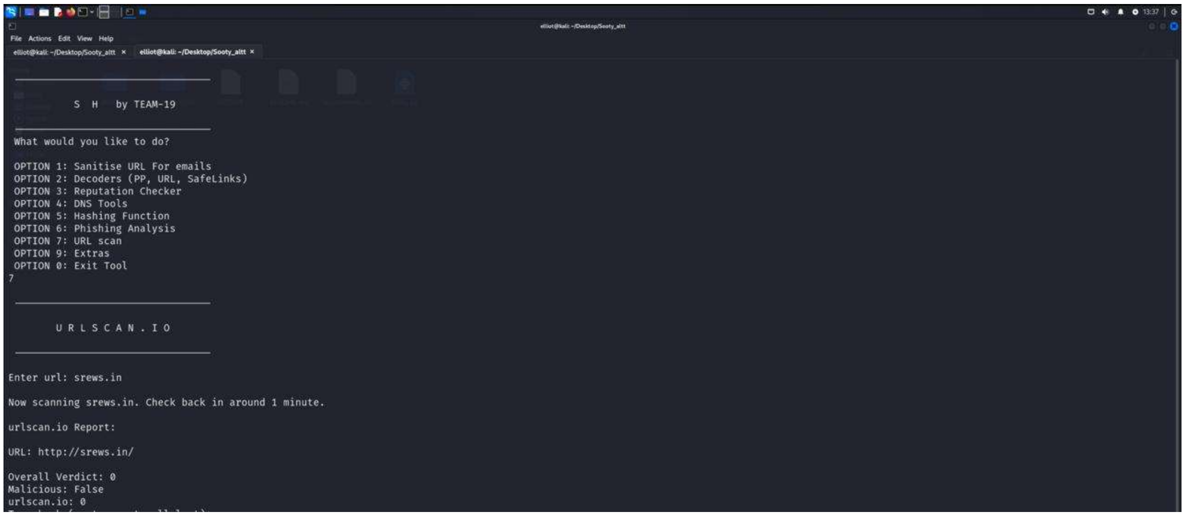
```
# VirusTotal Integration
def scan_url(api_key, url):
    vt_url = "https://www.virustotal.com/vtapi/v2/url/report"
    params = {
        'apikey': api_key,
        'resource': url,
        'allinfo': 'true'
    }
    response = requests.get(vt_url, params=params)
    if response.status_code == 200:
        return response.json()
    else:
        return {"error": "Failed to retrieve data from VirusTotal", "status_code":
response.status_code}

# Hashing Functions
def hash_file(file_path, algorithm='sha256'):
    try:
        hasher = hashlib.new(algorithm)
        with open(file_path, 'rb') as f:
            buf = f.read()
            hasher.update(buf)
        return hasher.hexdigest()
    except Exception as e:
        return f"Error hashing file: {str(e)}"

def hash_text_input(text, algorithm='sha256'):
    hasher = hashlib.new(algorithm)
    hasher.update(text.encode('utf-8'))
    return hasher.hexdigest()

# URL Sanitization
def sanitize_url(url):
    return requests.utils.quote(url)

# Decoders
def proofpoint_decoder(encoded_url):
    decoded_url = encoded_url.replace('https://urldefense.proofpoint.com/v2/url?u=', '')
    decoded_url = requests.utils.unquote(decoded_url.split('&')[0])
    decoded_url = decoded_url.replace('_', '/')
    decoded_url = decoded_url.replace('3A', ':')
    decoded_url = decoded_url.replace('2F', '/')
    return decoded_url

def url_decoder(encoded_url):
    return requests.utils.unquote(encoded_url)

def url_unshortener(url):
    try:
        response = requests.get(url, allow_redirects=True)
        return response.url
    except requests.RequestException as e:
        return f"Error unshortening URL: {str(e)}"

def base64_decoder(encoded_text):
    try:
        return base64.b64decode(encoded_text).decode('utf-8')
    except Exception as e:
        return f"Error decoding base64: {str(e)}"

# DNS Lookup Functions
def dns_lookup(domain):
    try:
        result = dns.resolver.resolve(domain)
        return [str(ip) for ip in result]
    except dns.resolver.NoAnswer:
        return f"No DNS record found for domain {domain}"
    except dns.resolver.NXDOMAIN:
        return f"Domain {domain} does not exist"
    except dns.resolver.Timeout:
        return f"DNS request timed out for domain {domain}"
    except dns.exception.DNSException as e:
        return f"DNS lookup error: {str(e)}"

# Reverse DNS Lookup Function
def reverse_dns_lookup(ip_address):
    try:
        addr = dns.reversename.from_address(ip_address)
        domain_name = str(dns.resolver.resolve(addr, "PTR")[0])
        return domain_name
    except dns.resolver.NoAnswer:
        return f"No reverse DNS record found for IP {ip_address}"
    except dns.resolver.NXDOMAIN:
        return f"IP address {ip_address} does not exist in DNS"
    except dns.resolver.Timeout:
        return f"Reverse DNS request timed out for IP {ip_address}"
    except dns.exception.DNSException as e:
        return f"Reverse DNS lookup error: {str(e)}"

# WHOIS Lookup Function
def whois_lookup(domain):
    try:
        result = whois.whois(domain)
        return result
    except Exception as e:
        return f"Error performing WHOIS lookup: {str(e)}"

@app.route('/')
def home():
    return render_template('index.html')

# URL Sanitizing Route
@app.route('/sanitize_url', methods=['POST'])
def sanitize_url_route():
    url = request.form['url']
    sanitized_url = sanitize_url(url)
    return render_template('index.html', sanitized_url=sanitized_url)

# Decoding Route
@app.route('/decode', methods=['POST'])
def decode_route():
    choice = request.form['decoder']
    input_text = request.form['input_text']
    if choice == 'proofpoint':
        decoded_url = proofpoint_decoder(input_text)
    elif choice == 'url':
        decoded_url = url_decoder(input_text)
    elif choice == 'unshorten':
        decoded_url = url_unshortener(input_text)
    elif choice == 'base64':
        decoded_url = base64_decoder(input_text)
    else:
        decoded_url = "Invalid choice"

    return render_template('index.html', decoded_url=decoded_url)

# Reputation Checker Route using VirusTotal
@app.route('/reputation', methods=['POST'])
def reputation_route():
    entity = request.form['entity']
    virustotal_api_key =
'c3414a3398e40fe13ec43ee46de24330ef58039e0a19a9522bf132e80f561988'  # Your
VirusTotal API key
    virustotal_result = scan_url(virustotal_api_key, entity)

    return render_template('index.html', virustotal_result=virustotal_result)

# Hashing Route
@app.route('/hashing', methods=['POST'])
def hashing_route():
    choice = request.form['hash_choice']
    if choice == 'file':
        file_path = request.form['file_path']
        file_hash = hash_file(file_path)
        reputation_result = None
    elif choice == 'text':
        text = request.form['text_to_hash']
        file_hash = hash_text_input(text)
        reputation_result = None
    elif choice == 'check_hash':
        hash_value = request.form['hash_to_check']
        file_hash = None
        virustotal_api_key =
'c3414a3398e40fe13ec43ee46de24330ef58039e0a19a9522bf132e80f561988'  # Your
VirusTotal API key
        reputation_result = scan_url(virustotal_api_key, hash_value)
    else:
        file_hash = "Invalid choice"
        reputation_result = None

    return render_template('index.html', file_hash=file_hash,
reputation_result=reputation_result)

# DNS Lookup Route
@app.route('/dns_lookup', methods=['POST'])
def dns_lookup_route():
    choice = request.form['dns_choice']
    if choice == 'lookup':
        domain = request.form['domain']
        result = dns_lookup(domain)
    elif choice == 'reverse':
        ip_address = request.form['ip_address']
        result = reverse_dns_lookup(ip_address)
    elif choice == 'whois':
        domain = request.form['domain']
        result = whois_lookup(domain)
    else:
        result = "Invalid choice"

    return render_template('index.html', dns_result=result)

# URL Scan Integration
@app.route('/url_scan', methods=['POST'])
def url_scan_route():
    url = request.form['url_to_scan']
    api_key = 'your_urlscan_api_key'
    scan_url = "https://urlscan.io/api/v1/scan/"
    payload = {"url": url}
    headers = {"API-Key": api_key}
    response = requests.post(scan_url, json=payload, headers=headers)

    return render_template('index.html', urlscan_result=response.json())

if _name_ == "_main_":
    app.run(debug=True)
```

Appendix B


elliot@kali: ~/Desktop/Sooty_altt
File Actions Edit View Help
elliot@kali: ~/Desktop/Sooty_altt ×
elliot@kali: ~/Desktop/Sooty_altt ×

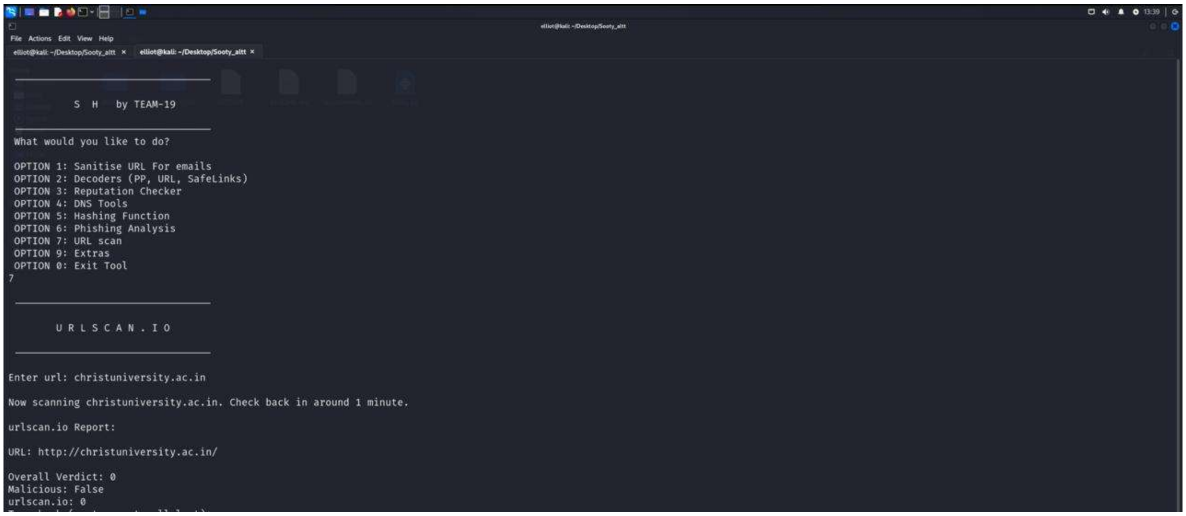
```
 ______________________________

        S  H   by TEAM-19
 ______________________________

 What would you like to do?

 OPTION 1: Sanitise URL For emails
 OPTION 2: Decoders (PP, URL, SafeLinks)
 OPTION 3: Reputation Checker
 OPTION 4: DNS Tools
 OPTION 5: Hashing Function
 OPTION 6: Phishing Analysis
 OPTION 7: URL scan
 OPTION 9: Extras
 OPTION 0: Exit Tool
7

 ______________________________

       U R L S C A N . I O
 ______________________________

Enter url: https://jainuniversity.ac.in

Now scanning https://jainuniversity.ac.in. Check back in around 1 minute.

urlscan.io Report:

URL: https://jainuniversity.ac.in/

Overall Verdict: 0
Malicious: False
urlscan.io: 0
```

appendix b Fig.1 url scan


elliot@kali: ~/Desktop/Sooty_altt
File Actions Edit View Help
elliot@kali: ~/Desktop/Sooty_altt ×
elliot@kali: ~/Desktop/Sooty_altt ×

```
 ______________________________

        S  H   by TEAM-19
 ______________________________

 What would you like to do?

 OPTION 1: Sanitise URL For emails
 OPTION 2: Decoders (PP, URL, SafeLinks)
 OPTION 3: Reputation Checker
 OPTION 4: DNS Tools
 OPTION 5: Hashing Function
 OPTION 6: Phishing Analysis
 OPTION 7: URL scan
 OPTION 9: Extras
 OPTION 0: Exit Tool
7

 ______________________________

       U R L S C A N . I O
 ______________________________

Enter url: srews.in

Now scanning srews.in. Check back in around 1 minute.

urlscan.io Report:

URL: http://srews.in/

Overall Verdict: 0
Malicious: False
urlscan.io: 0
```

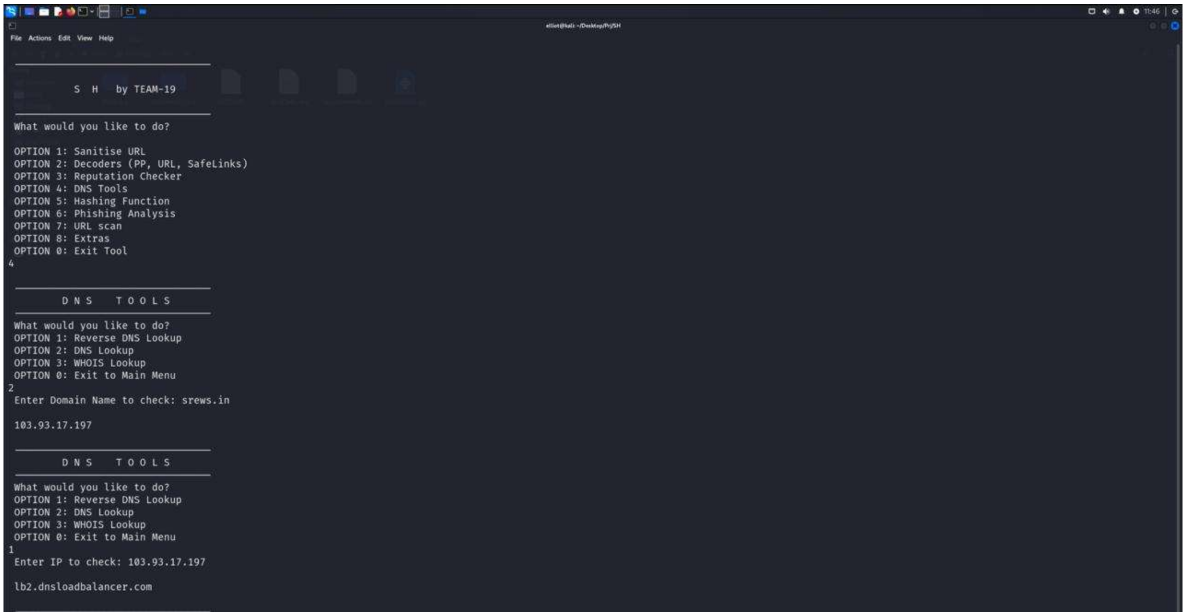
appendix b Fig.2 url scan



File Actions Edit View Help
elliot@kali: ~/Desktop/Sooty_altt
elliot@kali: ~/Desktop/Sooty_altt

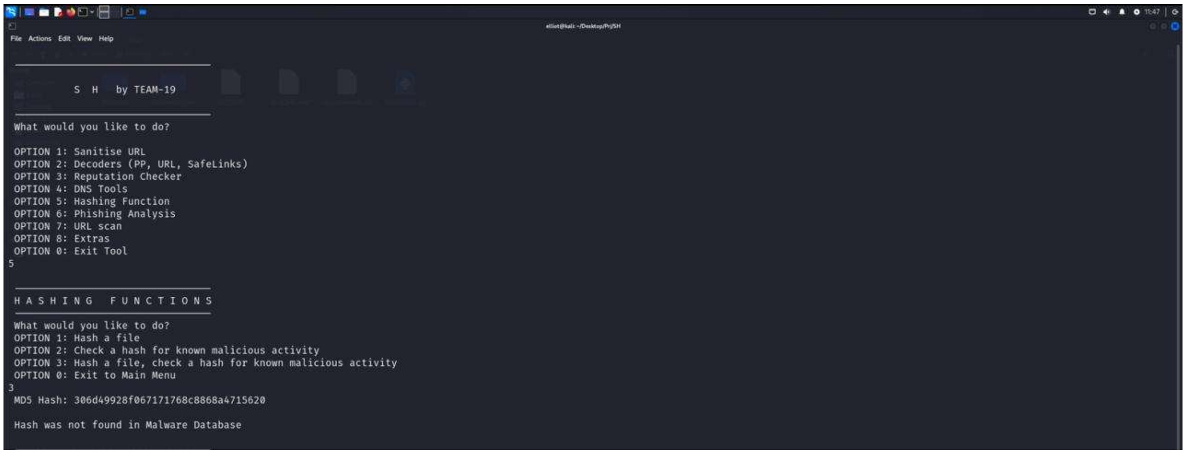
```
 ________________________________

        S  H   by TEAM-19

 ________________________________
 What would you like to do?

 OPTION 1: Sanitise URL For emails
 OPTION 2: Decoders (PP, URL, SafeLinks)
 OPTION 3: Reputation Checker
 OPTION 4: DNS Tools
 OPTION 5: Hashing Function
 OPTION 6: Phishing Analysis
 OPTION 7: URL scan
 OPTION 9: Extras
 OPTION 0: Exit Tool
7

 ________________________________

       U R L S C A N . I O

 ________________________________

Enter url: christuniversity.ac.in

Now scanning christuniversity.ac.in. Check back in around 1 minute.

urlscan.io Report:

URL: http://christuniversity.ac.in/

Overall Verdict: 0
Malicious: False
urlscan.io: 0
```

appendix b Fig.3 url scan



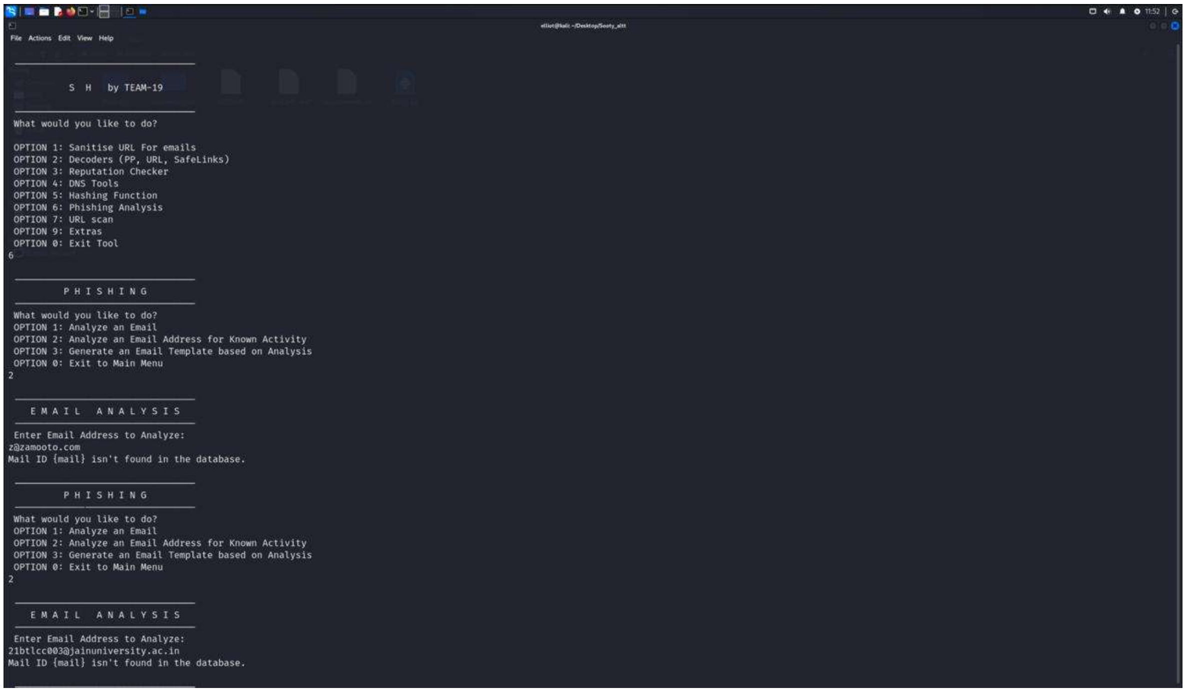
```
 ________________________________

        S  H   by TEAM-19

 ________________________________
 What would you like to do?

 OPTION 1: Sanitise URL
 OPTION 2: Decoders (PP, URL, SafeLinks)
 OPTION 3: Reputation Checker
 OPTION 4: DNS Tools
 OPTION 5: Hashing Function
 OPTION 6: Phishing Analysis
 OPTION 7: URL scan
 OPTION 8: Extras
 OPTION 0: Exit Tool
4

 ________________________________
        D N S   T O O L S
 ________________________________
 What would you like to do?
 OPTION 1: Reverse DNS Lookup
 OPTION 2: DNS Lookup
 OPTION 3: WHOIS Lookup
 OPTION 0: Exit to Main Menu
2
 Enter Domain Name to check: srews.in

 103.93.17.197

 ________________________________
        D N S   T O O L S
 ________________________________
 What would you like to do?
 OPTION 1: Reverse DNS Lookup
 OPTION 2: DNS Lookup
 OPTION 3: WHOIS Lookup
 OPTION 0: Exit to Main Menu
1
 Enter IP to check: 103.93.17.197

 lb2.dnsloadbalancer.com
```

appendix b Fig.4 dns tools



```
 ────────────────────────────────

          S  H   by TEAM-19

 ────────────────────────────────
 What would you like to do?

 OPTION 1: Sanitise URL
 OPTION 2: Decoders (PP, URL, SafeLinks)
 OPTION 3: Reputation Checker
 OPTION 4: DNS Tools
 OPTION 5: Hashing Function
 OPTION 6: Phishing Analysis
 OPTION 7: URL scan
 OPTION 8: Extras
 OPTION 0: Exit Tool
5

 ────────────────────────────────
 H A S H I N G   F U N C T I O N S
 ────────────────────────────────
 What would you like to do?
 OPTION 1: Hash a file
 OPTION 2: Check a hash for known malicious activity
 OPTION 3: Hash a file, check a hash for known malicious activity
 OPTION 0: Exit to Main Menu
3
 MD5 Hash: 306d49928f067171768c8868a4715620

 Hash was not found in Malware Database
```

appendix b Fig.5 Hashing function



```
 ────────────────────────────────

          S  H   by TEAM-19

 ────────────────────────────────
 What would you like to do?

 OPTION 1: Sanitise URL For emails
 OPTION 2: Decoders (PP, URL, SafeLinks)
 OPTION 3: Reputation Checker
 OPTION 4: DNS Tools
 OPTION 5: Hashing Function
 OPTION 6: Phishing Analysis
 OPTION 7: URL scan
 OPTION 9: Extras
 OPTION 0: Exit Tool
6

 ────────────────────────────────
         P H I S H I N G
 ────────────────────────────────
 What would you like to do?
 OPTION 1: Analyze an Email
 OPTION 2: Analyze an Email Address for Known Activity
 OPTION 3: Generate an Email Template based on Analysis
 OPTION 0: Exit to Main Menu
2

 ────────────────────────────────
   E M A I L   A N A L Y S I S
 ────────────────────────────────
 Enter Email Address to Analyze:
z@zamooto.com
Mail ID {mail} isn't found in the database.

 ────────────────────────────────
         P H I S H I N G
 ────────────────────────────────
 What would you like to do?
 OPTION 1: Analyze an Email
 OPTION 2: Analyze an Email Address for Known Activity
 OPTION 3: Generate an Email Template based on Analysis
 OPTION 0: Exit to Main Menu
2

 ────────────────────────────────
   E M A I L   A N A L Y S I S
 ────────────────────────────────
 Enter Email Address to Analyze:
21btlcc003@jainuniversity.ac.in
Mail ID {mail} isn't found in the database.
```

appendix b Fig.6 Phishing