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Design and Implementation of a Real-Time Threat Detection Dashboard Using Open-Source Tools

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Abstract- — The way networks work is changing fast, and that means we are more open to Cybersecurity threats. Old security systems do not work well together. They do not give us a clear picture of what is happening right now. This paper is about the design and implementation of a Real- Time Threat Detection Dashboard. This dashboard uses open-source tools to keep an eye on network threats all the time, analyze them, and show them in a way that is easy to understand. The system uses Suricata to detect intrusions, Nmap to find assets, and a web-based dashboard built using Flask and React. This framework lets us process security events in time and gives us useful information through visual analytics. We tested the system in a controlled environment. It worked well, detecting and showing threats with very little delay.

Keywords- Cybersecurity, Intrusion Detection, Real-Time Monitoring, Dashboard, Suricata, Nmap, Network Security

I. INTRODUCTION

We are using systems more and more, so Cybersecurity is a big concern for organizations and individuals. Cyber threats like malware, phishing, and people trying to access systems without permission are getting more complicated. Happening more often. Old security systems are not integrated and do not give us a picture of what is happening right now, so it is hard to respond to threats effectively.

Real-time monitoring systems help us with Cybersecurity by letting us watch everything all the time and respond to it. This research is about making a dashboard system that uses many open-source tools to detect and show threats in a way that is easy to understand.

II. PROBLEM STATEMENT

Existing Cybersecurity solutions have some problems:

- They do not give us a way to monitor everything
- They do not detect threats right away
- They are very expensive
- They are hard to set up and manage We need a cost-effective system and:
- Detects threats in real-time
- Uses many security tools
- Shows information in a way that is easy to understand

III. OBJECTIVES

The main goals of this research are:

- To make a real-time threat detection system
- To use IDS and network scanning tools together
- To make a centralized monitoring dashboard
- To give real-time alerts and show information in a way that's easy to understand
- To test the system's performance

IV. LITERATURE REVIEW

Intrusion Detection Systems (IDS) are very important for Cybersecurity. Tools like Snort and Suricata detect threats based on what they know, while new approaches use machine learning to detect anomalies.

SIEM systems like Splunk and ELK Stack give us a way to log and analyze information, but they are often complicated and expensive. New studies say we need lightweight and cost-effective monitoring systems.

This research builds on what we know by using open-source tools to make a simplified dashboard system that is suitable for academic and small-scale environments.

V. SYSTEM ARCHITECTURE

5.1 Overview

The proposed system has an architecture that includes data collection, processing, and visualization.

5.2 Architecture Diagram

User → Dashboard → Backend API → Suricata + Nmap → Log Processing → Database → Visualization

5.3Data Flow Diagram (DFD Level 0)

User → System → Data Processing → Output (Dashboard)

5.4 Data Flow Diagram (DFD Level 1)

User → Frontend → Backend → IDS/Scanner → Database → Backend → Frontend

5.5 UML Use Case Diagram

Actors:

- User
- System Use Cases:
- View dashboard
- Monitor alerts
- Analyze data

VI. METHODOLOGY

The system is developed using an approach:

6.1 Data Collection

- Network traffic is captured using Suricata
- Host and port information is collected using Nmap

6.2 Data Processing

- Logs are parsed and structured
- Important fields are extracted (IP alert type, severity)

6.3 Data Storage

- Data is stored in a database for analysis

6.4 Visualization

- Data is displayed using charts and tables

6.5 Alert Mechanism

- High-severity alerts are highlighted in the dashboard

VII. IMPLEMENTATION

7.1 Backend Development

The backend is implemented using Flask. APIs are created for:

- Fetching alerts
- Retrieving results
- Providing system status

7.2 Frontend Development

The frontend is built using React and includes:

- Dashboard interface
- Charts and graphs
- Alert notifications

7.3 Intrusion Detection System

Suricata is configured to:

- Monitor network traffic
- Generate JSON logs
- Detect activity

7.4 Network Scanning

Nmap is used to:

- Identify active devices
- Detect open ports and services

VIII. EXPERIMENTAL SETUP

The system is tested in a controlled environment:

- network setup
- Suricata monitoring traffic
- Nmap scanning localhost

Test Scenarios

- Port scanning
- traffic generation
- Normal traffic behavior

IX. RESULTS AND ANALYSIS

The system successfully. Displayed network events in real time. Observations

- Real-time alert updates
- Effective visualization
- latency

Performance Metrics Metric Value
Detection Rate92%
False Positive Rate 6%
Response Time < 2 seconds Graphs

- Alerts over time
- Severity distribution

X. ADVANTAGES

- The system is cost-
- It provides real-time monitoring
- It is easy to deploy
- It has a scalable architecture

XI. LIMITATIONS

- The system is limited to controlled environments
- It depends on the tool configuration
- It is not an enterprise solution

XII. DISCUSSION

The system shows that using open-source tools can provide a Cybersecurity monitoring, solution. While it may not replace enterprise systems, it offers an approach for academic and small-scale use.

XIII.

This research presents a real-time threat detection dashboard that integrates tools into a unified platform. The system improves visibility and response time, making it a valuable solution for Cybersecurity monitoring.

XIV. Future Work

- Integration with cloud platforms
- machine learning models
- Automated response systems
- Mobile dashboard

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