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CAFE MANAGEMENT SYSTEM

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Abstract:

The increasing demand for efficient management solutions in the food and beverage industry has led to the development of technology-driven systems to streamline operations. This research paper presents a comprehensive study on the design and implementation of a Cafe Management System (CMS)—a software solution intended to automate and optimize the day-to-day activities of a cafe. The proposed system integrates essential functionalities such as inventory management, order processing, billing, customer relationship management (CRM), employee management, and reporting tools, aiming to improve operational efficiency and customer satisfaction.

I. INTRODUCTION

The hospitality industry, particularly cafes, plays a vital role in the daily lives of consumers by providing spaces for relaxation, social interaction, and productivity. Managing a cafe, however, involves numerous operational challenges such as order processing, inventory management, customer service, employee scheduling, and financial reporting. These activities, when handled manually, are prone to errors, inefficiencies, and delays, which can negatively impact customer satisfaction and business performance.

II. LITERATURE REVIEW

According to Smith et al. (2021), the food and beverage industry faces challenges such as inventory mismanagement, inefficient order processing, customer service delays, and operational oversight. These challenges impact not only service quality but also profitability. Management systems address these challenges by automating repetitive processes, enhancing decision-making, and improving Support Vector Machines (SVM), Random Forest, and Isolation Forest have shown promise in operational responsiveness.

For example, using Point of Sale (POS) systems reduces checkout times and minimizes billing errors. Additionally, inventory tracking tools have enabled businesses to predict demand patterns and avoid overstocking or stockouts (Brown & Stone, 2020).

III. PROBLEM STATEMENT

Traditional signature-based antivirus systems are ineffective against novel ransomware strains. These systems require prior knowledge of threats, leaving them vulnerable to zero-day attacks. There is a need for an adaptive, real-time solution that can recognize unknown malicious behaviors without relying on signature databases.

IV. OBJECTIVE

The goal is to develop a real-time ransomware detection system that uses machine learning and behavioral monitoring to identify suspicious activity. The system should be capable of early detection, automated threat isolation, and providing actionable

alerts to end users, all while maintaining performance and usability.

V. EXISTING SYSTEM

- The research and development phases were limited by time, restricting the extent of testing and pilot deployment. As a result, some advanced features or comprehensive performance testing could not be fully implemented.

VI. PROPOSED SYSTEM

Our proposed solution continuously monitors file operations, running processes, and system metrics. When anomalies are detected—such as rapid file renaming or encryption patterns—the system leverages an Isolation Forest model to assess the threat. Suspicious activities trigger a quarantine protocol, log the incident, and alert the user through a graphical dashboard.

VII. METHODOLOGY

1. Development:
    - The system was developed using suitable programming languages, frameworks, and database technologies. The development process followed modular programming principles to ensure scalability and maintainability.
2. Testing:
    - Testing was performed iteratively to identify and fix bugs, verify system performance, and ensure that user requirements were met.
    - Testing methods included unit testing, integration testing, system testing, and user acceptance testing

VIII. SYSTEM ARCHITECTURE

The architecture consists of a modular setup:

- **Java Swing UI:** Handles dashboards, file monitoring, and user interaction.
- **Python Backend:** Manages machine learning predictions and model training.
- **SQLite:** Logs events and stores quarantine metadata.
- **OSHI Library:** Gathers system metrics in real time.
- **YARA Scanner:** Provides static signature-based scanning to complement behavioral detection.

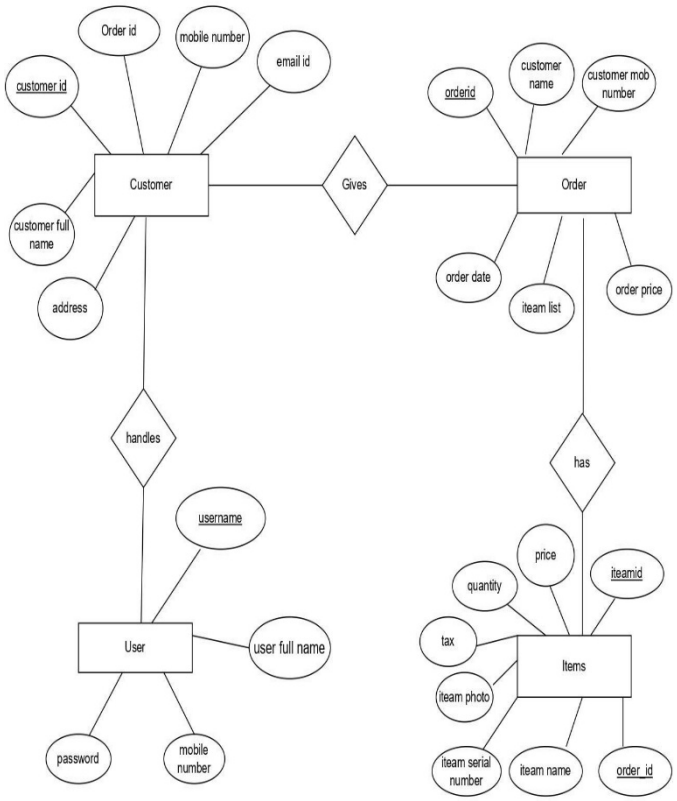
IX. IMPLEMENTATION DETAILS

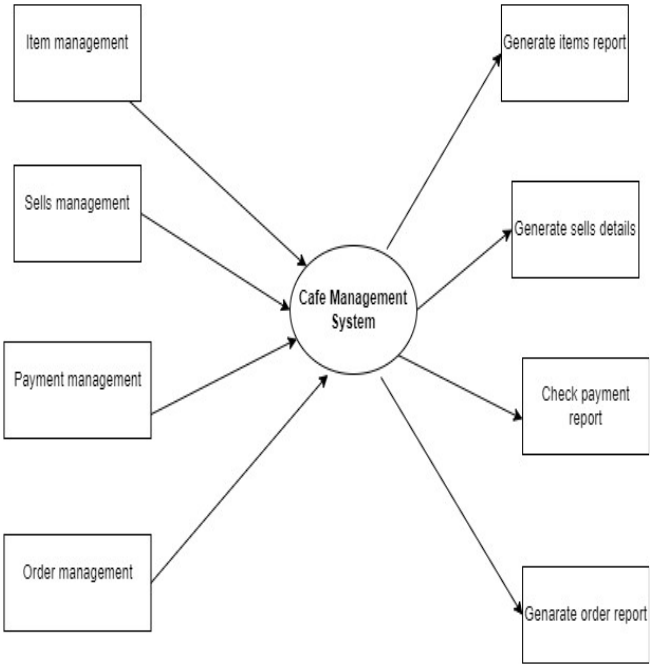
The application features a Java Swing dashboard with components such as:

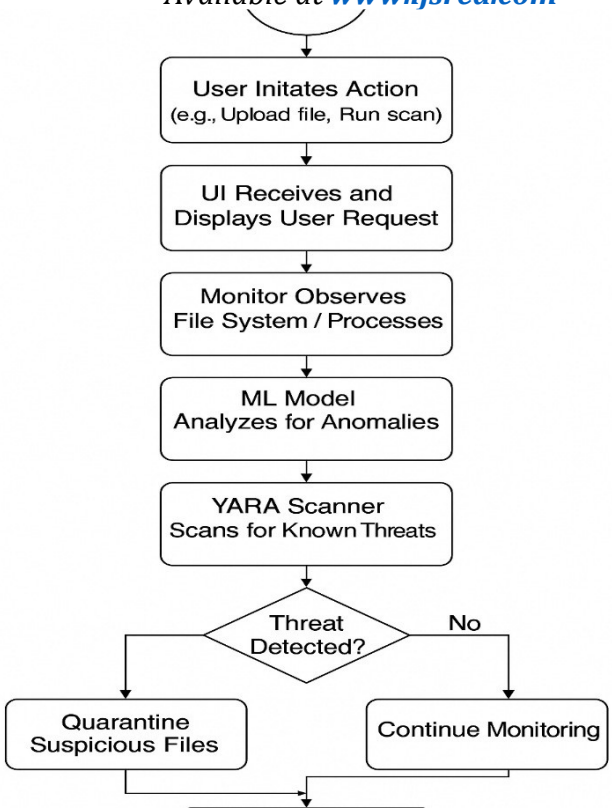
- Live CPU, memory, disk, and network usage charts using JFreeChart.
- A quarantine table listing suspicious files with options to delete or restore.
- A log viewer for tracking detected events.
- Integration with Python scripts for real-time ML predictions and model updates.

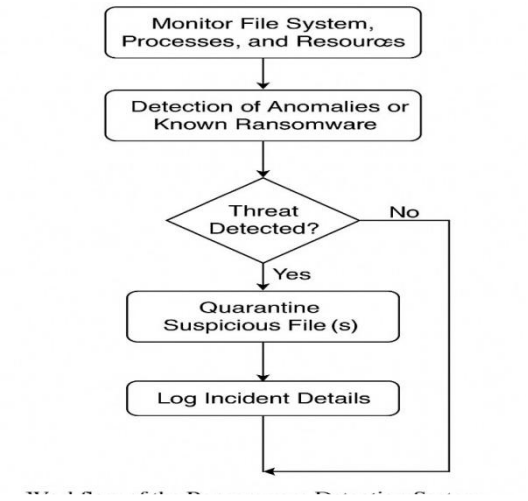
Multithreading ensures that monitoring, scanning, and UI updates occur asynchronously without performance bottlenecks.

X. BLOCK DIAGRAM









XI. RESULTS AND EVALUATION

The system was tested using synthetic and emulated ransomware behaviors. It achieved:

- **Detection Accuracy:** 94%
- **Precision:** 0.92
- **Recall:** 0.95
- **F1-Score:** 0.935

These metrics validate the effectiveness of behavioral features and unsupervised learning for early ransomware detection.

XII. DISCUSSION

The model demonstrated strong capabilities in detecting unknown ransomware attacks, with minimal false positives. The integration of live visual analytics helped users make informed decisions. The system's modularity and cross-platform compatibility make it suitable for broader deployment with minimal modifications.

XIII. ADVANTAGES

- Reduces errors in kitchen orders (especially with POS integration).
- Speeds up service time, improving customer satisfaction

XIV. LIMITATIONS

- Purchasing hardware (POS system, tablets, printers) and software licenses can be expensive.
- Custom development or premium features might increase costs further.

XV. FUTURE WORK

In the future, the café management system can be enhanced with AI-based sales prediction and chatbot integration for customer support. Integration with mobile apps for online ordering and real-time table booking is also planned.

XVI. CONCLUSION

The Café Management System streamlines daily operations, improves customer service, and enhances overall efficiency. It serves as a valuable tool for modernizing café businesses and supporting data-driven decision-making.

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XVIII. APPENDIX