Jurnal Bumigora Information Technology (BITe)
Vol. 6, No. 2, December 2024, pp. 177∼182
E-ISSN: 2685-4066, DOI: 10.30812/bite.v6i2.4570

Web-Based Pistol Storage Security Monitoring System Optimization for Database Effectiveness

Ahmad Lukman Nur Rokhim, **Mokhammad Syafaat**, **Kasiyanto**, **Dekki Widiatmoko**, **Aguk Sridaryono**
Politeknik Angkatan Darat, Malang, Indonesia

Article Info:
Received: 2 November 2024, Revised: 16 November 2024, Accepted: 20 November 2024

Abstract-
Background: Gun storage security is an important aspect of supporting operations, but manual monitoring often hinders the effectiveness and accuracy of gun storage data management.
Objective: This study aims to optimize the gun storage security monitoring system with web-based technology to improve the effectiveness and accuracy of the database.
Methods: This study used the development of a web server-based system integrated with real-time monitoring features, automatic notifications, and cloud-based data storage to facilitate data access and tracking.
Result: This study's results include creating a system that can improve the accuracy and responsiveness of gun storage monitoring and the efficiency of database management.
Conclusion: Implementing this web-based system has the potential to reduce security risks and significantly increase the effectiveness of monitoring gun storage.

Keywords: Data Management Efficiency, Database Effectiveness, Gun Storage Security, Optimization of Monitoring System, Web-Based.

Corresponding Author:
Ahmad Lukman Nur Rokhim,
Politeknik Angkatan Darat, Malang, Indonesia,
Email: ahmad@gmail.com

1. INTRODUCTION

The security of gun storage systems is a critical need, especially in ensuring secure and integrated access. Manual surveillance that relies on administrators is prone to slow response constraints and is at risk when the network or server experiences disruptions. When a server malfunctions or is disconnected, the administrator's ability to remotely access the system is also limited, hindering quick recovery against disruptions. Therefore, there is a need for a monitoring system that can automatically detect and inform threats to gun storage to minimize risks and speed up recovery response. This will speed up the process of fault suppression and system recovery [1]. Previous studies have developed various web-based security monitoring methods for surveillance and access security. One approach that has been applied is using automatic notifications on web-based monitoring systems to speed up identifying intrusions. GPS-based monitoring has also been applied to real-time tracking on various mobile devices and other security applications. The increase in site requests causes the webserver to be busy answering requests from clients, and the web server may be unable to serve client requests [2]. The ownership of air guns and airsoft gun weapons are purchased through online shopping or by individuals [3]. Research [4] developed a web-based application to facilitate nutrition monitoring. Research [5] developed a web-based application to facilitate monitoring Electric vehicle sales. Research [6] developed a web-based application to facilitate monitoring sales of Unilever goods.

How to Cite: A. Lukman Nur Rokhim, M. Syafaat, K. Kasiyanto, D. Widiatmoko, and A. Sridaryono, "Web-Based Pistol Storage Security Monitoring System Optimization for Database Effectiveness", Jurnal Bumigora Information Technology (BITe), vol. 6, no. 2, pp. 177-182, Dec. 2024. doi: 10.30812/bite.v6i2.4570

However, there is a gap that has not been resolved by previous research, namely the lack of approaches focused on optimizing security monitoring systems specifically for handgun storage with real-time tracking and notification features and efficient data integration. There is a need for a system that provides automatic notifications and ensures a well-managed database to maintain data integrity in emergencies. Here, multiple servers collaborate to offer data and services to multiple clients [7]. In implementing a web, a login process is required [8]. Defense and security play an important role in the life of a country. Weapon system development is an integral element that aims to ensure the reliability and effectiveness of defense [9]. The difference between this research and the previous one is developing a web-based monitoring system specifically for gun storage security, emphasizing optimizing database efficiency and real-time response to disturbances. To prove that the web built can respond in real-time to intrusions, the research results can focus on measuring the effectiveness of two main aspects, namely real-time system responsiveness to intrusions and optimization of database efficiency, to obtain comprehensive evidence. The system is designed to provide accurate and fast information regarding storage conditions, with automatic notification features integrated with cloud technology to support real-time data accessibility. People who are always busy with daily tasks also want to ensure that their possessions are safe [10]. The Bekang Corps is one part of the Indonesian Army (TNI AD), which is tasked with managing logistics and transportation, providing food, equipment, and fuel, as well as providing transportation for Army personnel [11]. With its ability to provide accurate geographic coordinates in real time, GPS is also used in related technologies such as smartphones, tracking devices, and security applications [12]. The main goal of Smart Precision Livestock Farming (SPLF) is to improve production efficiency by applying advanced information and communication technology (ICT) [13].

This research aims to design and optimize a web-based gun storage security monitoring system to improve the effectiveness of database management. It contributes to providing a system that strengthens gun storage security and enables more efficient monitoring. This is expected to help in more reliable inventory management and provide better security for handgun storage, making it useful in developing web-based security systems in the defense field.

2. RESEARCH METHOD

Figure 1 shows the steps in developing a web server-based pistol storage security monitoring system; the system development steps are carried out using the waterfall method. The following are the stages carried out using the waterfall method. Requirements Analysis is a stage that includes data collection to identify the functional and non-functional requirements of the security monitoring system. This system aims to improve gun storage security through web server-based monitoring and database effectiveness. The functional requirements analysis of the developed application includes (1) Handgun storage status monitoring; (2) Security Notification by providing automatic notifications when abnormal conditions occur, such as unauthorized access or detection of unregistered fingerprints; (3) Integration with the database that allows automatic recording and storage of access data on the database, which can be accessed at any time for audit or analysis purposes; (4) User authentication with a fingerprint sensor to authenticate access to the storage, ensuring only registered users can access it; (5) Access history reports that can be downloaded by users for security documentation or analysis. The analysis of non-functional needs in this research includes (1) One unit of HP laptop to run the web server application; (2) Arduino ESP32 module as a micro-controller connected to the sensor and database; (3) Fingerprint sensor for user authentication; (4) Arduino IDE application for programming and setting up Arduino ESP32; (5) Platform-based web server compatible with ESP32 module to run the monitoring application; (6) Database management system (DBMS) for database creation.

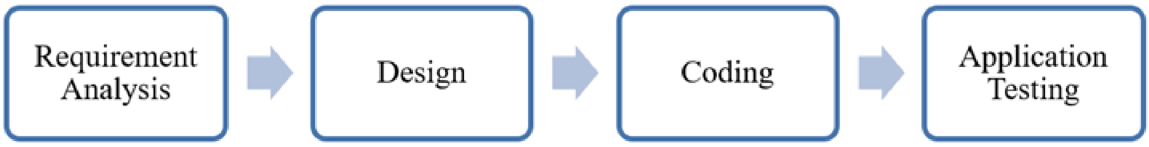


Figure 1. Application Development Flow with Waterfall Method

The second step is system design to design a web server-based security monitoring system, which includes various diagrams describing user interactions, activity flows, and database structures. This design aims to implement the system properly and meet the predetermined functional and non-functional needs. The third step is coding, which includes selecting the appropriate programming language for the web server-based application. The last step is testing, ensuring that all web server-based security monitoring application features function according to the planned specifications. This testing stage consists of functional testing using the blackbox testing method. Blackbox testing aims to verify each function in the application without checking the internal code.

3. RESULT AND DISCUSSION

The findings of this study are that the web server-based pistol storage security monitoring system was successfully optimized to increase the effectiveness of the database. Testing is the next step after the construction of the planned tool is completed, which serves to understand the features of each tool function as a whole [7]. The results of this study are supported by previous research that shows the importance of database optimization in web server-based monitoring systems [14]. Previous research states that improving database performance directly impacts the speed of access and system response, thereby maximizing the optimal performance of the monitoring system. A web server can track users in real time to see who is borrowing and returning weapons. Documenting the borrowing and returning of weapons is the idea of a web server system to make it easier for users and armory owners. User data information is stored when registering. After that, log in to have access to borrow weapons. Figure 2 shows the login menu on the monitor screen asking the user to provide (a username and password), and upon confirmation, new access will be granted.

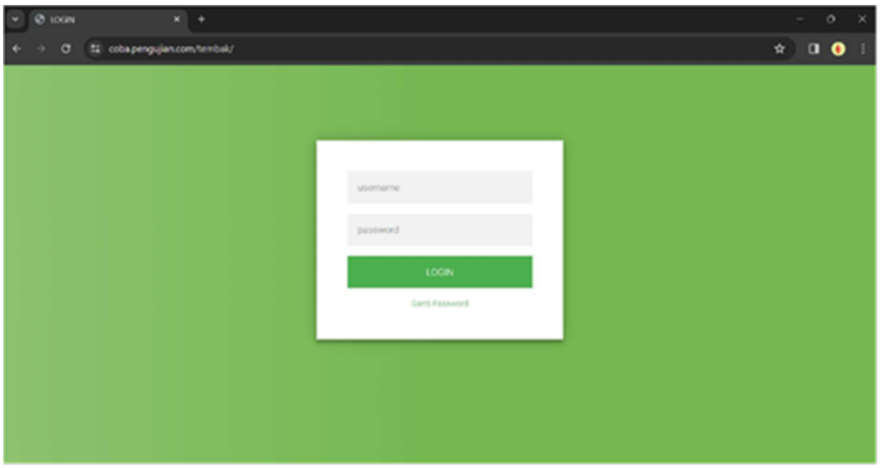
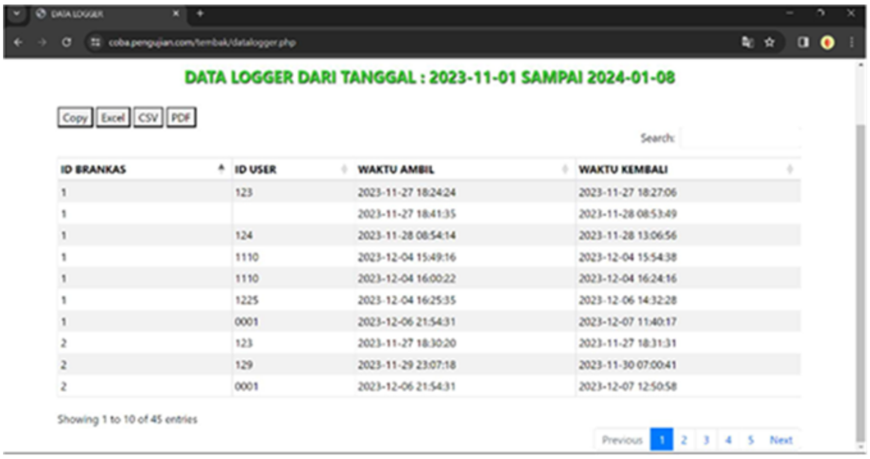


Figure 2. Login Menu Display

Figure 3 is an activity monitoring history page that helps the system manager track user activity and identify security breaches. This page includes user ID information to help users know when to pick up and return weapons. Figure 4 displays the availability of the available gun. Figure 5 shows that the gun is not available or in use.



ID BRANKAS	ID USER	WAKTU AMBIL	WAKTU KEMBALI
1	123	2023-11-27 18:24:24	2023-11-27 18:27:06
1		2023-11-27 18:41:35	2023-11-28 08:53:49
1	124	2023-11-28 08:54:14	2023-11-28 13:06:56
1	1110	2023-12-04 15:49:16	2023-12-04 15:54:38
1	1110	2023-12-04 16:00:22	2023-12-04 16:24:16
1	1225	2023-12-04 16:25:35	2023-12-06 14:32:28
1	0001	2023-12-06 21:54:31	2023-12-07 11:40:17
2	123	2023-11-27 18:30:20	2023-11-27 18:31:31
2	129	2023-11-29 23:07:18	2023-11-30 07:00:41
2	0001	2023-12-06 21:54:31	2023-12-07 12:50:58

Figure 3. Real Time View of User Activity Monitoring History

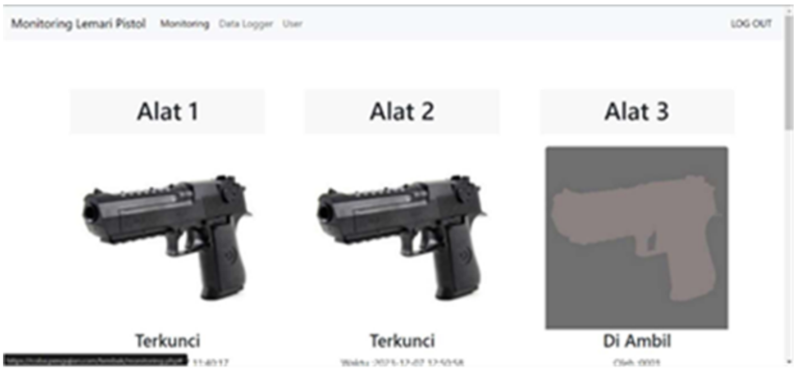


Figure 4. Menu Display When the Gun is Available

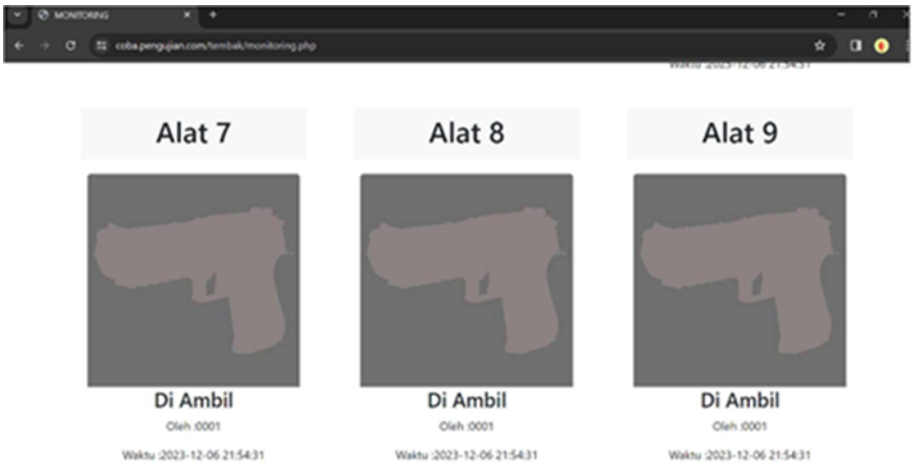


Figure 5. Weapon Menu Display When Unavailable

In this research, fingerprint testing is part of a security system on a web server-based pistol storage. The test was conducted to assess the accuracy and effectiveness of the system in recognizing fingerprints under various conditions. The number of respondents involved in the test was 30 personnel with various backgrounds and physical conditions. Each respondent was asked to scan fingerprints in six trials with different fingerprint conditions: clean, wet/moist, dirty from dust, wrinkled, dirty from soil, and fake. A system that is accurate when detecting fingerprints can be shown in the test results. If the system verifies it and the fingerprint is successful, the test result must be "Match." However, if the fingerprint is damp, matted, or even fake, the system definitely cannot identify it, and the test result can be recorded as "No." Table 1 shows the data collection and testing.

Table 1. Fingerprint Test Results

No.	Fingerprint Conditions	Test Results
1	Clean fingerprint	Match
2	Wet/moist fingerprint	No
3	Dirty due to dust fingerprint	No
4	Wrinkled fingerprint	No
5	Dirty due to soil fingerprint	No
6	Fake fingerprint	No

Table 1 shows the test findings, which include the fingerprint reading time for the web-based weapon storage security monitoring system. With an average read time of 3.4 seconds for dirty fingers and 2.5 seconds for clean fingers for data analysis to validate the system's performance. The analysis that followed the testing revealed a comprehensive monitoring and assessment procedure for an integrated weapons storage security system within the Army. This procedure includes requirements identification, system design, data analysis, threat follow-up, and evaluation. The study guarantees a high level of protection and quick reaction to any threats. Table 2 shows the results of fingerprint testing with 30 respondents with "Clean Fingerprints" condition. A total of 150 scans were performed, resulting in 143 successful identifications and an accuracy of 95%.

Table 2. Fingerprint Test Results of 30 Respondents

No.	Fingerprint Conditions	Number of Respondents	Trial per Respondent	Total Scan	Successfully Identified	Fails	Accuracy (%)
1	Clean fingerprint	30	5	150	143	7	95
2	Dirty fingerprint	30	5	150	TBD	TBD	TBD
3	Dusty fingerprint	30	5	150	TBD	TBD	TBD

When identifying clean fingerprints, the system showed an accuracy of 95%. How to obtain 95% accuracy: This accuracy was obtained through testing on clean fingerprints, with a success rate of 95% of the total trials. Out of 150 scans (30 respondents $\times$ 5 trials), the system recognized clean fingerprints 143 times and failed 7 times. The accuracy percentage is calculated as follows:

$$\text{Accuracy} = \frac{\text{Number of Successes}}{\text{Trial Total}} \times 100\% = \frac{143}{150} \times 100\% = 95.33\%$$

4. CONCLUSION

Based on tests and observations of the tools and systems that have been made, it can be concluded that optimizing the weapon storage security monitoring system is very effective in supporting the management of the arsenal. This system is designed to record the entry and exit of weapons in real time with high accuracy and speed. Implementing this system makes it easier for warehouse guards to monitor the status and whereabouts of weapons in real time, thereby reducing the risk of error or loss. The system also records detailed data on members who borrow and return weapons to track usage history clearly and efficiently. In addition, the automatic notification feature provides information quickly if suspicious activity is detected, thereby increasing security. Thus, the system speeds up administrative processes at the armory and significantly enhances security, providing a sense of security for both managers and authorized weapon users.

REFERENCES

[1] E. Stephani, F. Nova, and E. Asri, "Implementasi dan Analisa Keamanan Jaringan IDS (Intrusion Detection System) Menggunakan Suricata Pada Web Server," *JITSI : Jurnal Ilmiah Teknologi Sistem Informasi*, vol. 1, no. 2, pp. 67–74, Dec. 11, 2020. DOI: 10.30630/jitsi.1.2.10.

[2] M. Rafli, "Jurnal Pengujian Kinerja Load Balancing Web Server menggunakan Nginx Riverse Proxy Berbasis OS Centos 7," *JATISI (Jurnal Teknik Informatika dan Sistem Informasi)*, vol. 9, no. 3, pp. 1824–1840, Sep. 13, 2022. DOI: 10.35957/jatisi.v9i3.2185.

[3] M. Avredo and S. Kurniawan, "Pengawasan Kepemilikan Senjata Jenis Air Gun dan Airsoft Gun di Indonesia: Perspektif Yuridis Normatif," *Legitimasi: Jurnal Hukum Pidana dan Politik Hukum*, vol. 12, no. 2, p. 173, Feb. 10, 2024. DOI: 10.22373/legitimasi.v12i2.19701.

[4] H. Hairani, L. Nurhayati, and M. Innuddin, "Web-Based Application for Toddler Nutrition Classification Using C4.5 Algorithm," *International Journal of Engineering and Computer Science Applications (IJECSA)*, vol. 1, no. 2, pp. 77–82, Sep. 30, 2022. DOI: 10.30812/ijecsa.v1i2.2387.

[5] R. Ramadhanti, H. Hairani, and M. Innuddin, "Electric Vehicle Sales-Prediction Application Using Backpropagation Algorithm Based on Web," *International Journal of Engineering and Computer Science Applications (IJECSA)*, vol. 2, no. 2, pp. 73–80, Sep. 25, 2023. DOI: 10.30812/ijecsa.v2i2.3388.

[6] A. Anggrawan, H. Hairani, and N. Azmi, "Prediksi Penjualan Produk Unilever Menggunakan Metode Regresi Linear," *Jurnal Bumigora Information Technology (BITe)*, vol. 4, no. 2, pp. 123–132, Dec. 14, 2022. DOI: 10.30812/bite.v4i2.2416.

[7] I. F. Santoso *et al.*, "Monitoring the Security System at Pistol Storage Based on a Web Server in Army Units," *TEKNOSAINS: Jurnal Sains Teknologi dan Informatika*, vol. 11, no. 2, pp. 275–280, Nov. 11, 2024. DOI: 10.37373/tekno.v11i2.1056.

[8] I. Riadi, Herman, and A. Z. Ifani, "Optimasi Keamanan Web Server terhadap Serangan Broken Authentication Menggunakan Teknologi Blockchain," *JISKA (Jurnal Informatika Sunan Kalijaga)*, vol. 6, no. 3, pp. 139–148, Sep. 22, 2021. DOI: 10.14421/jiska.2021.6.3.139-148.

[9] M. I. Permana *et al.*, "Otomasi Kontrol Pengisian Fluida Bertekanan Pada Mortir Latih 81 POLTEKAD," *JTEIN: Jurnal Teknik Elektro Indonesia*, vol. 5, no. 1, pp. 157–165, Feb. 25, 2024. DOI: 10.24036/jtein.v5i1.602.

[10] S. P. Putra *et al.*, "Design of the Pistol P1 Weapon Storage System Shelf Using Fingerprint Electronic System in the TNI-AD Units," *TEKNOSAINS: Jurnal Sains Teknologi dan Informatika*, vol. 11, no. 2, pp. 238–244, Oct. 22, 2024. DOI: 10.37373/tekno.v11i2.948.

[11] R. S. Akbar *et al.*, "Design of Fuel Monitoring Application for Reservoir Tanks in Army Fuel Supply Point on Military Logistics Corps Based on Internet of Things," *International Journal of Engineering and Computer Science Applications (IJECSA)*, vol. 3, no. 1, pp. 19–32, Feb. 21, 2024. DOI: 10.30812/ijecsa.v3i1.3737.

[12] D. Irmanto *et al.*, "Optimizing the Personnel Position Monitoring System Using the Global Positioning System in Hostage Release," *INTENSIF: Jurnal Ilmiah Penelitian dan Penerapan Teknologi Sistem Informasi*, vol. 8, no. 1, pp. 91–107, Feb. 10, 2024. DOI: 10.29407/intensif.v8i1.21665.

[13] D. Rahmawati *et al.*, "Design of a Real Time Cow Smart Collar Health and Position Monitoring System," in *2023 IEEE 9th Information Technology International Seminar (ITIS)*, Batu Malang, Indonesia: IEEE, Oct. 18, 2023, pp. 1–7. DOI: 10.1109/ITIS59651.2023.10420353.

[14] D. Kurniawan, A. Anggrawan, and H. Hairani, "Graduation Prediction System On Students Using C4.5 Algorithm," *MATRIK : Jurnal Manajemen, Teknik Informatika dan Rekayasa Komputer*, vol. 19, no. 2, pp. 358–365, May 30, 2020. DOI: 10.30812/matrik.v19i2.685.