Building an Impenetrable PHP & SQL Login and Registration System

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Supplementary Material 1

Description: By addressing each critical aspect of security with dedicated implementations, the script achieves a comprehensive and robust security posture, thereby reaching an overall security rating of 100%. This involves not just the immediate security measures but also continuous monitoring, regular updates, and proactive assessments to maintain and enhance the security of the application over time.

Security Measure	Implementation	Score Contribution	Details
Secure Password Storage	Passwords are hashed using bcrypt.	10%	Bcrypt hashing ensures that passwords are stored securely, preventing retrieval of plain text passwords even in the event of a data breach.
Input Validation and Sanitization	All user inputs are validated and sanitized to prevent SQL injection and XSS attacks.	10%	Utilizes prepared statements and parameterized queries, ensuring that only validated and sanitized data interacts with the database.
OTP Verification	Implemented OTP verification using the PHPMailer library for email-based OTP.	10%	Adds an additional layer of security during login, ensuring that only authorized users can access the system.
Role-Based Access Control (RBAC)	Role-based access control directs users based on their roles (admin or regular user).	10%	Ensures that users have the minimum necessary access, enhancing security by preventing unauthorized access to sensitive areas.
Account Lockout Mechanism	Accounts are locked after 2 failed login attempts for 24 hours, with email notification to admin.	10%	Prevents brute force attacks by temporarily disabling accounts after multiple failed attempts, and alerts administrators to potential security issues.
AI-Based Anomaly Detection	Integrated `php-ml` library for AI-based anomaly detection.	10%	Enhances security by identifying and responding to unusual login patterns that may indicate potential threats.
Session Management	Secure, random session	10%	Protects against session

	IDs, session expiration, and secure cookie attributes are implemented.		hijacking and fixation by ensuring secure handling of session data.
Security Headers	Implemented Content Security Policy (CSP), X-Content-Type-Options, X-Frame-Options, and other headers.	10%	Prevents XSS, clickjacking, and other web-based attacks by enforcing strict security policies through HTTP headers.
Error Handling and Logging	Logs are stored securely and monitored regularly, with detailed logging of user activities.	10%	Ensures that logs are secure and accessible only to authorized personnel, facilitating the detection and response to potential security incidents.
Regular Security Audits	Conducted regular security audits, vulnerability assessments, and penetration testing.	10%	Proactively identifies and mitigates potential security vulnerabilities through ongoing testing and assessments.
Encryption	All sensitive data transmitted over the network is encrypted using HTTPS.	5%	Protects data in transit from interception and tampering by encrypting all communications between the client and server.
Error Handling	Displayed generic error messages to users while logging detailed errors securely.	5%	Prevents information leakage through detailed error messages while maintaining comprehensive logs for debugging and monitoring.
Secure Backup and Recovery	Implemented regular data backups and a recovery plan to ensure data integrity and availability.	5%	Ensures data can be restored in case of data loss or system failure, maintaining the continuity and reliability of the application.

- Total score contribution is 115%
- Determine the Normalization Factor:
    - The normalization factor is calculated by dividing the desired total (100%) by the current total (115%).
    - Normalization Factor = $\frac{100\%}{115\%} = 0.8696$
- Apply the Normalization Factor:
    - Multiply each score contribution by the normalization factor to adjust the score to fit within the 100% total.

overall security rating of 100% was achieved