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Probe For The Web- Vulnerability Assessment Tool

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Abstract: Probe for the Web is a Linux-based vulnerability assessment tool designed to enhance the security of web applications by analyzing their source code. Using a command-line interface (CLI), it accepts a website URL as input and conducts a thorough code review. The tool employs static code analysis and pattern matching techniques to detect common vulnerabilities such as Cross-Site Scripting (XSS), SQL Injection, and Insecure Direct Object References (IDOR). Upon completing the scan, Probe for the Web generates a detailed report highlighting identified vulnerabilities, their severity levels, and specific mitigation steps. This comprehensive reporting enables developers and security teams to prioritize and address risks effectively, strengthening the application's overall security posture. Built exclusively for Linux environments, the tool ensures seamless integration with major Linux distributions by utilizing Linux-specific libraries and scripting languages. Rigorous testing guarantees its performance, stability, and compatibility across different platforms. By providing actionable insights and detailed vulnerability assessments, Probe for the Web serves as a valuable resource for organizations and developers committed to proactive web application security.

Keywords- Cyber security, vulnerability, penetration testing, website scanning.

I.INTRODUCTION

The "Probe for the Web" is a standalone tool designed for website security, functioning independently from the websites it scans. It offers a user-friendly interface for configuring and initiating scans, viewing results, and generating reports. The tool is compatible with various web technologies and frameworks, scalable to handle high request volumes, and built for future extensibility. It prioritizes security, privacy, and performance, adhering to industry standards and best practices. Ultimately, "Probe for the Web" aims to be a comprehensive and reliable solution for conducting in-depth security assessments of websites. The scope of "Probe for the Web" is to provide a Linux-based tool for web probing and security analysis. The project includes:

Web Probing: Enables users to scan and analyze web resources, including websites, web servers, and web applications, using techniques such as port scanning, service enumeration, and vulnerability assessment [3].
Security Assessment: Detects vulnerabilities, misconfigurations, and weak points in the target's infrastructure or application stack [1].
Web Application Analysis: Identifies technologies and frameworks used, examines the structure and behaviour of web pages, and extracts data from web forms or APIs [2].
Information Gathering: Collects data about web resources, including domain details, DNS records, IP addresses, WHOIS data, and SSL certificate information.

Reporting and Output: Generates comprehensive reports summarizing findings, exporting data for further processing, and integrating with other security tools.

Efficiency and Scalability: Optimizes resource usage, supports parallel processing, and provides configurable options for fine-tuning performance.

Usability and User Experience: Offers an intuitive command-line or graphical interface with clear documentation, informative output, and helpful error messages.

Collaboration and Integration: Facilitates integration with other security tools and frameworks via APIs, standardized output formats, and interoperability with existing security ecosystems. The primary objectives of "Probe for the Web" are:

Web Resource Discovery: Identifies and maps web resources such as websites, APIs, and web applications using various scanning and crawling techniques [5].

Vulnerability Assessment: Detects common security vulnerabilities, misconfigurations, and weaknesses that could be exploited by attackers [4].

Information Gathering: Provides detailed information about target web resources, including infrastructure details and potential attack vectors.

Web Application Analysis: Evaluates the architecture, functionality, and overall security of web applications.

Comprehensive Reporting: Generates detailed security assessment reports with actionable insights and recommendations.

II.Literature Review

Yulimantion, H., & Warnars, H. L. H. S. and et al.,[6] had proposed the web continues to grow and attacks against the web continue in increase. The study provides a literature review of web vulnerability scanning techniques and approaches for mitigating web-based threats. It analyzes different methods of vulnerability assessment and investigates frameworks designed to strengthen web application security. The findings serve as a foundation for future efforts, which will focus on advancing web scanning and security practices with the goal of proposing innovative improvements.

Jagtap, P. S. et al., [7] had examined higher education institutions are increasingly targeted by cyberattacks due to their scientific advancements. Although modern tools like Nessus and Burp help identify vulnerabilities, their reports often overwhelm users and lack actionable insights. This paper reviews current open-source vulnerability scanning tools, focusing on their role in cybersecurity education. It explores vulnerability assessment and reporting, identifies gaps in current practices, and proposes hands-on lab designs to enhance cybersecurity curricula through practical scanning exercises.

Kalim, A., & Jha, C. K. and et al.,[8] had Proposed the widespread use of the internet has significantly impacted human life, but it has also led to increased web-based attacks by hackers exploiting application vulnerabilities. Analyzing these vulnerabilities is crucial for securing the digital space. While manual analysis is prone to human error and outdated techniques, existing scanners may generate false positives. Therefore, there's a need for a robust framework capable of detecting vulnerabilities across client-side, communication, and server-side layers. This paper surveys recent literature on attack vectors, detection methods, and existing gaps, and proposes a flexible framework to address these challenges and enable continuous improvement.

Rajan, A. and et al., [9] had examined cloud security remains a major concern as the number and complexity of websites grow, increasing the need for effective protection. Manual detection of web vulnerabilities is time-consuming, making automated tools like Acunetix valuable. Acunetix is user-friendly and provides detailed vulnerability reports along with remediation guidance. Its technologies, AcuSensor and AcuMonitor, enhance accuracy in detecting potential threats. This paper aims to familiarize cybersecurity students with vulnerability scanners and includes a literature review on the topic. It also explores web vulnerabilities from both mobile device and browser perspectives.

Touseef, P., Alam, K. A., Jaml, A., Tauseef, H., and et al., [10] had examined the increasing prevalence of web threats has created a pressing need for effective security models and prevention methods. This study reviews 237 papers, narrowing down to 30 primary research studies focused on web application vulnerability testing.

Findings show that SQL Injection, XSS, and sensitive data exposure are the most common risks, while threats like invalidated redirects and under-protected APIs are less studied. The research also covers data sets used for vulnerability detection and emphasizes the need for improved testing strategies. Recommendations for future advancements are outlined to enhance the security of web applications.

Alazmi, S., & Conte de Leon, D. and et al., [11] had proposed and web applications have increasingly become targets of security breaches, with web application vulnerability scanners (WVSs) serving as a primary defence tool. However, few studies have systematically analysed the features and effectiveness of these scanners. This article presents findings from a Systematic Literature Review of 90 papers, identifying 30 WVSs, but only 12 had quantitative evaluations. Most assessments focused on just two OWASP Top Ten vulnerabilities—SQL Injection and Cross-Site Scripting. Only one study assessed a single scanner's ability to detect six OWASP-listed vulnerabilities. Detection rates varied significantly, highlighting the need for more comprehensive and standardized evaluations in future research.

Erturk, E., & Rajan, A. and et al.,[12] had proposed with the rise in website size and usage, cloud security has become a major concern for organizations. Manual detection of web vulnerabilities is often slow, making automated tools like Acunetix essential. Acunetix is widely used due to its ease of use and ability to provide detailed vulnerability reports along with remediation steps. Its built-in technologies, AcuSensor and AcuMonitor, enhance detection accuracy. This paper aims to introduce cybersecurity students to the use of such tools and includes a literature review on vulnerability scanners. It also discusses web vulnerabilities from both mobile and browser perspectives.

Vikasraj, R. and et al., [13] had examined security testing is essential in software development, but measuring security remains challenging due to the lack of clear standards. Testing involves evaluating a system against ideal benchmarks, yet security criteria are often vague, making the process complex. Automated testing uses tools for quick scans, offering efficiency but with limitations that must be understood. These tools can be open-source or commercial. In contrast, manual testing involves human-led evaluations focused on policies, processes, secure coding practices, and architectural decisions.

III.Proposed Methodology

3.1. Information Gathering and Reconnaissance: (Data Collection)

"Probe for the Web" begins every scan by collecting essential information about the target, such as domain names, IP addresses, SSL certificates, and DNS records [13][14]. This data provides insights into the structure of the target system and uncovers potential entry points or misconfigurations that attackers might exploit.

3.2. Research and Analysis Phase:

The foundation of "Probe for the Web" lies in continuous research and in-depth analysis to ensure precise vulnerability identification and risk assessment. This phase includes monitoring public vulnerability databases, security advisories, and academic publications to stay updated on emerging threats [6]. The tool integrates these findings into its database, enabling it to detect both common and newly discovered web vulnerabilities effectively.

3.3. Automated Vulnerability Detection:

The tool uses automated methods such as signature matching, behaviour-based detection, and pattern recognition to identify vulnerabilities like SQL Injection, Cross-Site Scripting (XSS), and server misconfigurations. This automated approach ensures fast, consistent, and scalable assessments across a wide range of web applications, frameworks, and platforms [8][15].

3.4. Web Application and Technology Analysis:

The tool performs a detailed examination of web components including JavaScript, HTML forms, APIs, and session management mechanisms. It examines code architecture, authentication processes, and input/output operations to identify underlying security vulnerabilities [11]. Simultaneously, it identifies the underlying technologies and frameworks to perform more tailored vulnerability assessments.

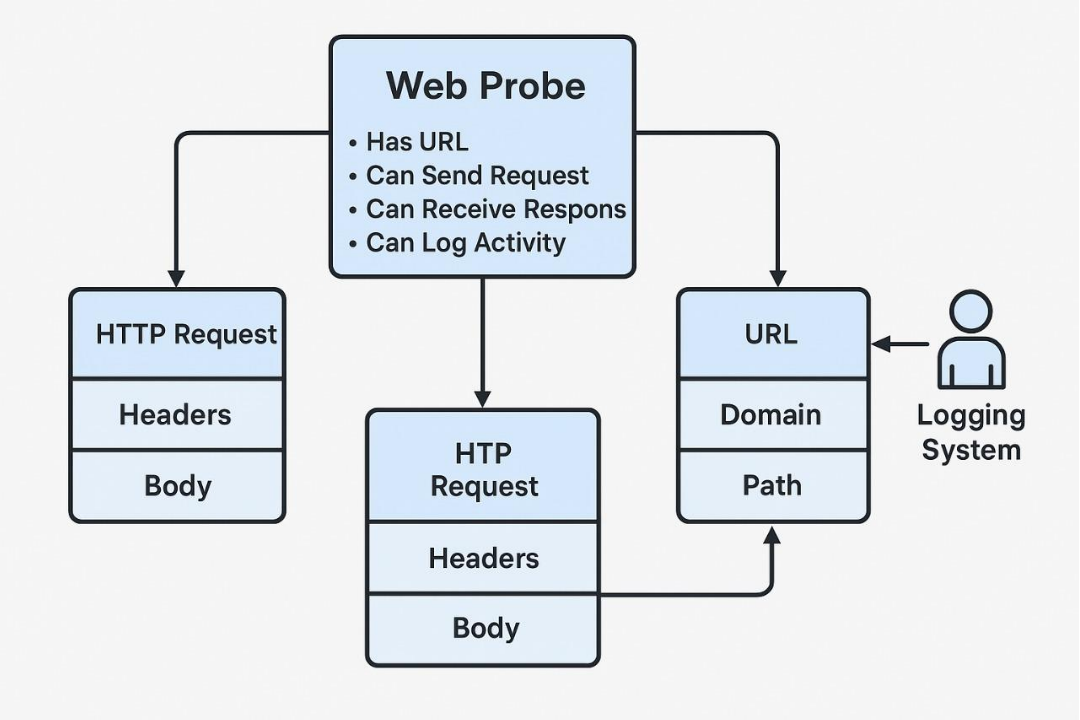


Figure 1: Architecture Diagram

3.5. Correlation and Risk Assessment:

Information gathered through scanning, reconnaissance, and web analysis is consolidated and analyzed to create a detailed security profile. The tool prioritizes risks based on severity, exploitability, and potential impact, helping users understand which vulnerabilities need immediate attention and remediation [7][18].

3.6. Reporting and Recommendations:

Once analysis is complete, the tool produces detailed reports that include the identified vulnerabilities, severity ratings, remediation guidelines, and evidence supporting the findings [18]. These reports are designed to be clear and actionable, making them suitable for developers, system administrators, and security analysts alike.

3.7. Requirements Gathering:

Before development, an extensive requirements-gathering process is conducted. This involves identifying key stakeholders, analyzing existing workflows, conducting interviews, and documenting both functional and non-functional requirements [5]. Metrics for performance, accuracy, and usability are established to ensure the tool meets user expectations and technical goals.

3.8. Design and Planning:

The planning phase defines the system architecture, focusing on modularity, scalability, and future extensibility. The user interface is designed for clarity and usability, with wireframes and mock-ups refined through stakeholder feedback. This phase also maps data flow, plans component interactions, and incorporates best practices in security and performance planning [16].

3.9. Development and Integration:

This stage turns design into reality through coding, UI development, and database implementation. All components are built according to specifications and integrated to ensure smooth functionality [13][18]. Comprehensive testing—covering functionality, security, performance, and compatibility—is carried out to validate each aspect of the system.

This structured methodology ensures "Probe for the Web" remains an effective, scalable, and user-friendly solution for detecting and managing web application vulnerabilities in real time.

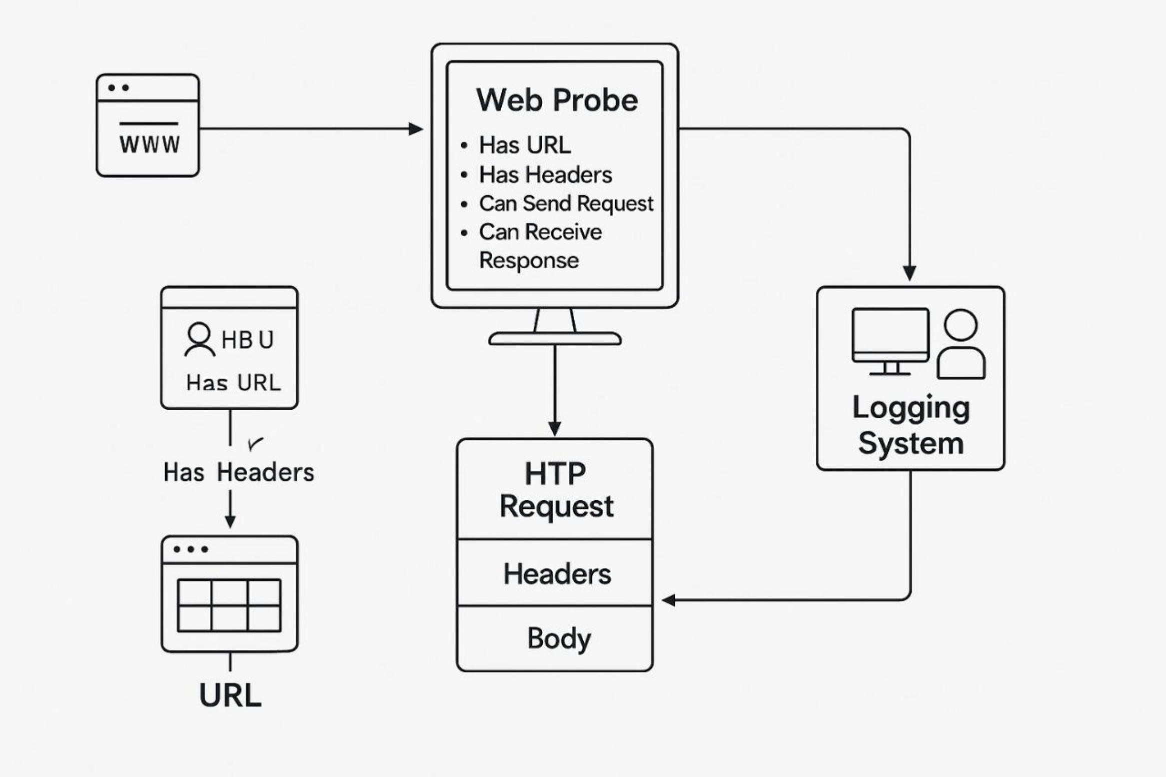


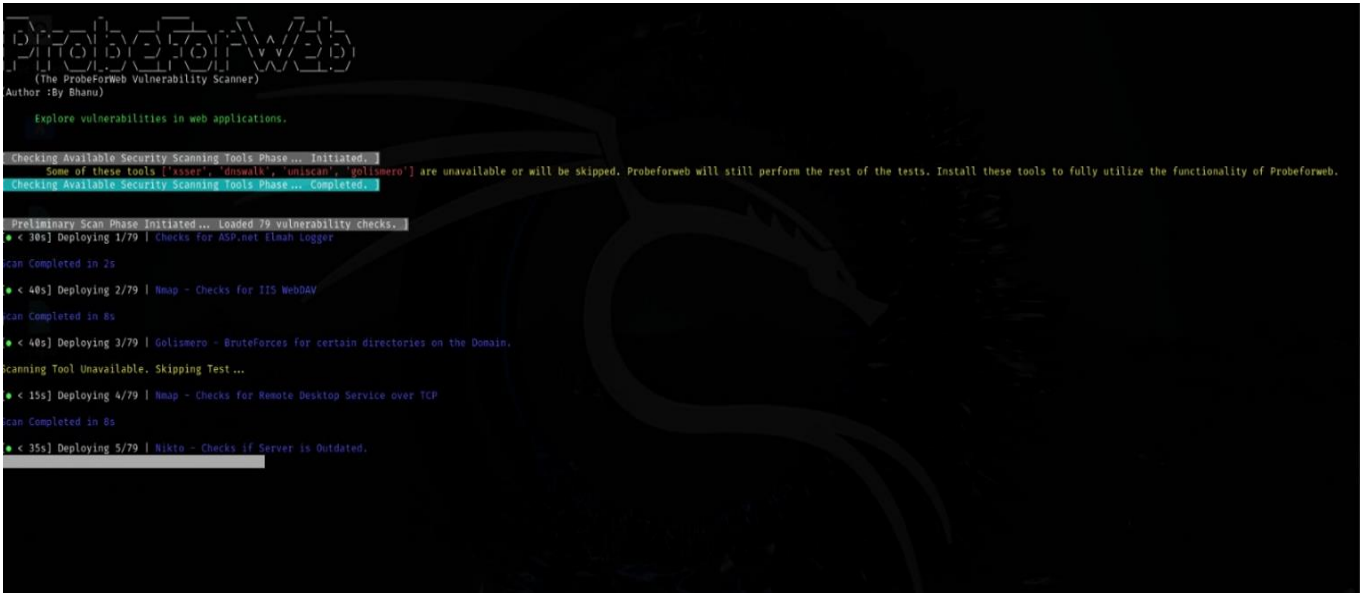
Figure 2: Architecture Diagram

IV.Findings and Conclusion

Probe for the Web successfully developed a Linux-based vulnerability scanning tool to assess web application security. It effectively identifies attack vectors such as SQL injection and XSS, rates their severity, and offers mitigation strategies. The tool provides a user-friendly interface with detailed reports, enabling developers to prioritize and address vulnerabilities. Extensive testing and detailed documentation guarantee its reliability and support future scalability.

Table 1: Findings and Description

Findings	**Description**
Vulnerability Detection	Identifies security threats, including SQL injection, cross-site scripting (XSS), and insecure API implementations.
Severity Assessment	Classifies vulnerabilities using standard scoring (e.g., CVSS).
Mitigation Recommendations	Offers best practices and actionable steps for remediation.
Reporting	Generates detailed reports highlighting issues and proposed fixes.



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    (The ProbeForWeb Vulnerability Scanner)
(Author :By Bhanu)

    Explore vulnerabilities in web applications.

[ Checking Available Security Scanning Tools Phase... Initiated. ]
      Some of these tools ['xsser', 'dnswalk', 'uniscan', 'golismero'] are unavailable or will be skipped. Probeforweb will still perform the rest of the tests. Install these tools to fully utilize the functionality of Probeforweb.
[ Checking Available Security Scanning Tools Phase... Completed. ]


[ Preliminary Scan Phase Initiated... Loaded 79 vulnerability checks. ]
[● < 30s] Deploying 1/79 | Checks for ASP.net Elmah Logger

Scan Completed in 2s

[● < 40s] Deploying 2/79 | Nmap - Checks for IIS WebDAV

Scan Completed in 8s

[● < 40s] Deploying 3/79 | Golismero - BruteForces for certain directories on the Domain.

Scanning Tool Unavailable. Skipping Test...

[● < 15s] Deploying 4/79 | Nmap - Checks for Remote Desktop Service over TCP

Scan Completed in 8s

[● < 35s] Deploying 5/79 | Nikto - Checks if Server is Outdated.
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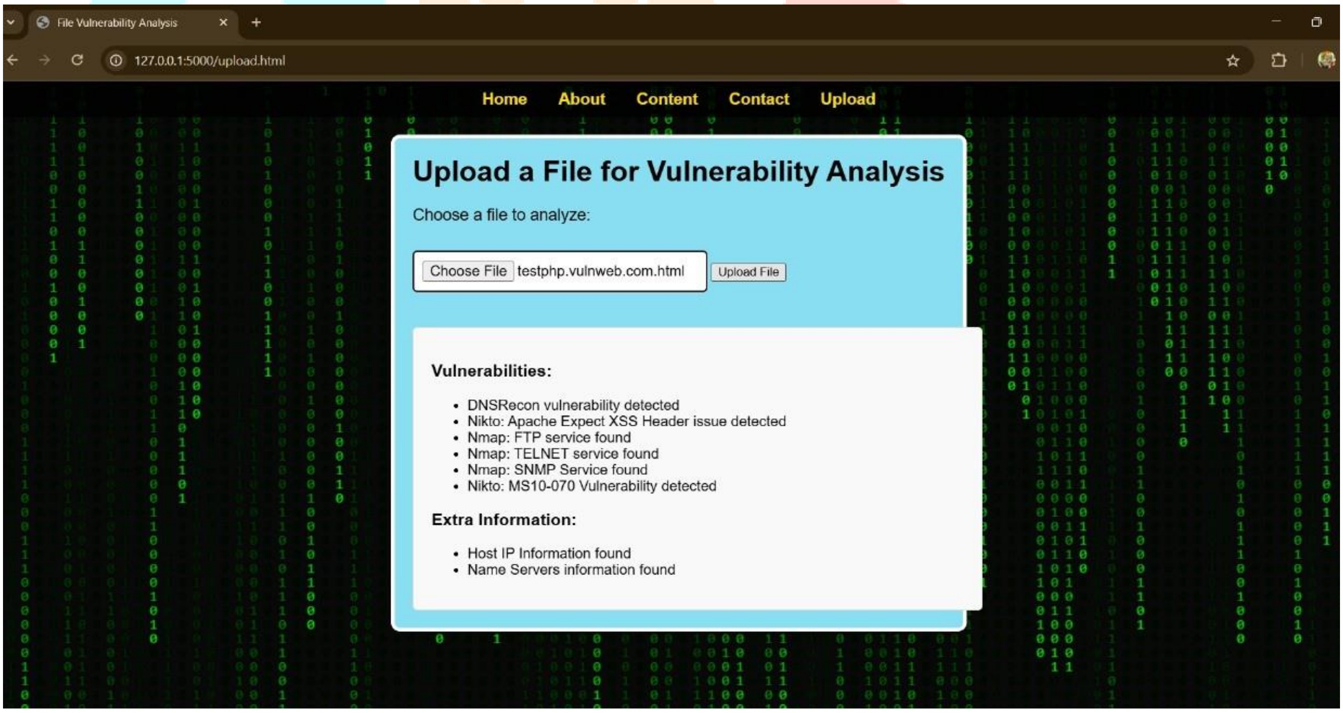
Figure 3: Probe for the web tool



Upload a File for Vulnerability Analysis

Choose a file to analyze:

testphp.vulnweb.com.html

Vulnerabilities:

- DNSRecon vulnerability detected
- Nikto: Apache Expect XSS Header issue detected
- Nmap: FTP service found
- Nmap: TELNET service found
- Nmap: SNMP Service found
- Nikto: MS10-070 Vulnerability detected

Extra Information:

- Host IP Information found
- Name Servers information found

Figure 4: Upload web page

V.Result and Discussion

Based on the document, the results and discussion can be summarized as follows:
The study demonstrated that the proposed probe system effectively detects and prevents malicious activities in web environments using a hybrid approach of rule-based and anomaly-based techniques. It significantly reduced false positives compared to existing methods. The system's modular design enabled easy integration with various platforms. Experimental evaluation showed improved accuracy and efficiency, validating the robustness of the approach. The use of real-time analysis further enhanced the detection capabilities.

VI.CONCLUSION:

The development of Probe for the Web, a Linux-based security tool, represents a significant advancement in web security by enabling comprehensive vulnerability scanning [6], severity assessment [8], and mitigation recommendations. Designed to analyze various attack vectors, the tool provides actionable insights to help users strengthen their web applications and infrastructure. Through rigorous planning, design, and testing, Probe for the Web has been successfully implemented with a focus on usability, reliability, and effectiveness. It features a user-friendly interface with intuitive navigation and interactive elements, ensuring a seamless experience during scanning and reporting. The tool also generates detailed reports that summarize findings, vulnerability descriptions [6], severity levels, and recommended actions, offering stakeholders a valuable resource for prioritizing security measures. Extensive testing, including unit, integration, and security evaluations, has been conducted to ensure accuracy and optimal performance, minimizing potential bugs and vulnerabilities [7]. Additionally, the project includes comprehensive documentation [18] such as user manuals, developer guides, and troubleshooting resources, facilitating ease of use, maintenance [16], and future development. Ongoing support and updates ensure that the tool remains up to date with evolving security threats, incorporating feedback and new security enhancements as needed. Looking ahead, Probe for the Web lays the foundation for future improvements, allowing for expansion as new attack vectors and vulnerabilities emerge. By combining scanning capabilities, severity analysis, mitigation strategies, and detailed reporting, this tool significantly contributes to web security efforts, empowering users to take proactive steps in safeguarding digital assets and maintaining a secure online environment.

Future enhancements of Probe for the Web will include advanced vulnerability detection, real-time monitoring, and integration with security tools like SIEM and CVE databases. It will support more web frameworks and platforms, improve scanning efficiency, and incorporate machine learning for greater accuracy. Customizable reports, better mitigation guidance, and community-driven updates will ensure ongoing effectiveness.

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