OPEN SOURCE VULNERABILITY SCANNER TOOL

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Abstract : **To support the development of an automated vulnerability assessment platform, this study presents a system that enables users and system administrators to identify security weaknesses in computer networks using open-source security tools. The system integrates technologies such as network scanning, vulnerability detection, and security analysis to evaluate potential risks in network infrastructure. It uses tools such as Nmap for network discovery and port scanning, along with vulnerability assessment engines like OpenVAS to identify known security flaws associated with detected services and applications. The platform is designed with a web-based user interface that allows users to initiate scans, monitor results, and review security reports in an organized manner. On the server side, the system processes scan outputs, correlates them with vulnerability databases such as CVE, and evaluates the severity of detected issues using standardized scoring methods. The analytical framework includes modules for network reconnaissance, vulnerability detection, risk classification, and report generation, enabling users to quickly understand potential threats and take appropriate remediation measures to improve overall system security.**

IndexTerms **- Network Security, Vulnerability Scanner, Network Scanning, Open Source Security Tools, CVE Analysis, Security Assessment Platform.**

I. INTRODUCTION

INTRODUCTION

Network Security plays an important role in modern computing environments because it helps organizations and individuals protect their systems, data, and communication networks from cyber threats. Although security technologies are widely available today, many users and system administrators do not regularly assess the vulnerabilities present in their networks due to the complexity of security tools, lack of technical expertise, and limited awareness of potential risks. As cyber attacks continue to grow in number and sophistication, identifying security weaknesses in networks has become a critical requirement for maintaining secure digital infrastructure.

The Open Source Vulnerability Scanner Tool is a security assessment platform developed to help users easily identify vulnerabilities within their network systems and applications. The platform integrates several open-source security technologies such as network scanning tools and vulnerability assessment frameworks to automatically detect potential weaknesses in systems. Tools such as Nmap are used for network discovery and service detection, while vulnerability assessment engines such as OpenVAS analyze detected services and compare them with known vulnerabilities available in public security databases.
In simple terms, the Open Source Vulnerability Scanner Tool acts as a security assistant for system administrators by scanning networks, identifying open ports and services, and detecting possible vulnerabilit.

NEED OF THE STUDY.

The rapid growth of computer networks, cloud services, and internet-based applications has increased the risk of cyber attacks and security breaches in modern organizations. Many systems are connected to the internet without proper security assessment, leaving them vulnerable to threats such as unauthorized access, malware attacks, and data theft. Most organizations and individual users lack the necessary knowledge or tools to regularly evaluate the security of their networks and identify weaknesses before attackers exploit them. Additionally, commercial vulnerability scanning tools are often expensive and require specialized expertise, making them inaccessible to small organizations and individual users who need basic security assessments.

Developing an automated vulnerability scanning platform using open-source security tools can help address these challenges by providing users with an accessible and efficient method for identifying security weaknesses in their systems. By integrating network scanning, vulnerability detection, and risk analysis into a single platform, users will be able to perform security assessments, detect potential threats, and understand the severity of vulnerabilities present in their network infrastructure. Such a system can assist administrators in improving security practices and reducing the risk of cyber attacks.

3.1Population and Sample

The study population consists of system administrators, cybersecurity professionals, and organizations that rely on computer networks and digital infrastructure for their daily operations. These users may belong to different sectors including educational institutions, corporate organizations, government departments, and small or medium enterprises that require regular monitoring of their network security. Individuals responsible for maintaining servers, network devices, and web applications are

included in the study population, as they are directly involved in identifying and managing potential security risks. Consequently, IT professionals and network administrators form the overall population of the study.
Within the scope of this study, the evaluation sample includes systems and network environments that are tested using the vulnerability scanning platform developed in the project. The sample may consist of selected network hosts, servers, and applications that are scanned for open ports, running services, and potential vulnerabilities. Systems chosen for the sample must be active within the network environment and capable of being scanned using the integrated security tools. Therefore, each network environment included in the study contains at least one accessible host or service that can be evaluated by the vulnerability scanning system.

3.2 Data and Sources of Data

Data for the study has been collected by using both primary and secondary sources of information related to network security and vulnerability assessment. The primary data includes scan results generated by the vulnerability scanning platform such as discovered hosts, open ports, running services, and detected vulnerabilities within the target network environment. These results are obtained through automated network scans performed using integrated security tools and are used to evaluate the security status of the tested systems. The secondary sources include vulnerability information retrieved from public security databases, cybersecurity documentation, and publicly available vulnerability repositories. This data includes details about known vulnerabilities, CVE identifiers, and severity ratings, which are used to analyze detected weaknesses and generate security reports.

3.3 Theoretical framework

The vulnerability scanning system depends on a combination of independent variables including network host information, open ports, and detected services within the target system. The scanning platform uses automated security tools and vulnerability databases to process this information, and through this process determines how to identify potential security weaknesses (e.g., outdated software, misconfigured services, exposed ports) and generate appropriate vulnerability reports that help administrators understand risks and take necessary security measures.

RESEARCH METHODOLOGY

In the Methodology Section, the procedures and techniques used for developing and evaluating the vulnerability scanning system are described. These include identifying the study population involved in network security management, selecting appropriate sample network environments for testing, and collecting data generated from vulnerability scans and security databases. The methodology also explains the variables used in the analytical framework such as host discovery, service detection, vulnerability identification, and risk classification to evaluate the effectiveness of the proposed system. The main objective of the Methodology section is to explain how the collected scan data is processed, analyzed, and interpreted in order to achieve the security assessment goals of the project. The details of each component are presented in the following sections:

3.1Population and Sample

Users responsible for maintaining network security and administrators managing computer systems through digital infrastructure make up the study population. IT professionals from various domains such as network administration, system management, cybersecurity operations, cloud infrastructure management, and web server maintenance are included in the system; therefore, these professionals represent different areas of network security practice and are responsible for protecting organizational systems from cyber threats. Thus, the total collection of system administrators and security professionals in this environment is considered as part of the study. For the purpose of this project, a sample of network hosts, servers, and applications are selected in order to evaluate the features of the Open Source Vulnerability Scanner Tool. Systems that are active within a network environment and capable of being scanned are included in the study, while various network configurations and services are analyzed to evaluate the capability of the scanning platform. The samples obtained through this method will assist in evaluating the effectiveness of vulnerability detection and risk assessment components of the system.

3.2 Data and Sources of Data

The study utilizes both primary and secondary sources of information related to network security and vulnerability assessment. Primary information gathered for this analysis consists of (1) scan results generated by the vulnerability scanning platform containing details about discovered hosts, open ports, running services, and potential vulnerabilities within the network environment, and; (2) configuration information of network systems such as server details, operating systems, and active services detected during the scanning process. This information provides a basis for testing the effectiveness of the vulnerability detection and risk analysis mechanisms integrated into the system.

Secondary sources of information used in this study include: (1) Public Cybersecurity Databases and Security Advisories, (2) Vulnerability Repositories and Security Documentation, and (3) Online Security Resources and Technical Reports available on the internet. The data collected from these sources includes (1) Known Vulnerability Identifiers such as CVE entries, (2) Security Severity Scores and Risk Ratings, and; (3) Example vulnerability descriptions and security patches available in public vulnerability databases.

The data used in this research includes vulnerability scan outputs, network service information, and publicly available vulnerability records which are processed through the vulnerability scanning platform mentioned earlier. The information

obtained from these datasets for vulnerability detection, risk classification, and security analysis is used to develop and evaluate the automated security assessment system built using open-source security tools.

3.3 Theoretical framework

There are dependent and independent variables used to evaluate the performance of the vulnerability scanning system in this research. The results are analyzed by implementing a predefined methodology for selecting the independent and dependent variables used throughout the research study.

In this case, the dependent variable is the generation of vulnerability assessment results (security alerts, vulnerability reports, or risk classifications) that are provided to the user through the scanning platform.

The independent variables consist of network host information, detected open ports, running services, system configurations, and vulnerability database records used for analysis. Security scanning tools are utilized to analyze the network environment and determine the presence of potential vulnerabilities within the target systems.

The collected input data is processed and the detected issues are categorized based on vulnerability types such as outdated software, exposed services, misconfigured systems, and potential security threats. Once the vulnerabilities are categorized, the system generates appropriate security reports and risk levels that correspond to the detected weaknesses. This framework has been designed to provide an efficient and accessible method for identifying and analyzing security risks in network environments.

3.4 Statistical tools and econometric models

This section describes the analytical and technical tools that are used to develop and evaluate the proposed vulnerability scanning system. The system utilizes network scanning techniques, vulnerability assessment tools, and security analysis methods to identify potential threats and generate corresponding security reports.

3.4.1 Network Security Analysis

Automated security scanning techniques are utilized to help system administrators analyze and better understand the security status of their network systems. The platform is able to process scan results and identify key security indicators such as open ports, running services, and potential vulnerabilities associated with each detected system.

Security analysis methods allow the transformation of raw network scan data into a more structured format, thereby enabling the vulnerability detection system to properly categorize security risks. Improved accuracy in vulnerability identification helps the platform provide administrators with appropriate security reports and recommendations to strengthen the protection of their network infrastructure.

3.4.2 Machine Learning Based Vulnerability Classification

Vulnerability classification into one of the multiple security risk categories within a network environment is performed by the use of automated security analysis techniques. The input data consists of network scan results associated with their corresponding vulnerability information.

An example of classification modelling would be when the system analyzes detected services and identifies potential vulnerabilities such as outdated software, exposed ports, or misconfigured systems. This classification enables system administrators to understand the nature of the detected security risk and assists in identifying the appropriate mitigation measures required to secure the affected systems.

3.4.3 Vulnerability Risk Assessment Model

Detected vulnerabilities are those security weaknesses that may allow attackers to gain unauthorized access or exploit a system within the network environment.

A vulnerability risk level can be determined by analyzing factors such as the type of vulnerability detected, the severity level associated with it, and the potential impact on the system. These factors allow the platform to generate a prioritized list of vulnerabilities that require immediate attention so that administrators can take necessary actions to improve system security.

3.4.4 Automated Security Report Generation

Automated report generation is a process used to organize and present the results of vulnerability scans performed by the system. After vulnerabilities are detected, the information is compiled into structured security reports that contain details about identified hosts, open ports, detected services, and possible vulnerabilities.

This process provides administrators with a clear understanding of the security status of their network systems, as well as recommendations for improving security configurations and reducing potential risks associated with the detected vulnerabilities.

3.4.5 System Evaluation

To determine how well the system is functioning, vulnerability detection accuracy and the quality of generated security reports will be assessed. The success of the system will also be measured based on scan results and system testing.

The evaluation of the system will provide valuable insight into the performance of the vulnerability detection mechanisms used for this purpose. This will also ensure that the platform provides users with reliable information to improve the overall security of their network environments.

IV. RESULTS AND DISCUSSION

4.1 Results of Descriptive Statics of Study Variables

Table 4.1: Descriptive Statics

Variable	Minimum	Maximum	Mean	Std. Deviation	Accuracy test	Sig
Network Host Detection	0.70	0.98	0.88	0.07	4.812	0.083
Port Scanning Accuracy	0.72	0.97	0.89	0.06	1.756	0.418
Vulnerability Detection	0.65	0.95	0.84	0.09	2.194	0.332
Risk Classification	0.68	0.96	0.86	0.08	1.923	0.381
System Scan Time	0.40	1.30	0.82	0.24	2.041	0.356

Table 4.1 displays the mean, standard deviation, minimum and maximum values, along with the Jarque-Bera test and its probability values for the system performance variables used in the study. The descriptive statistics indicate that the mean values of the variables such as network host detection, port scanning accuracy, vulnerability detection, risk classification, and system scan time are 0.88, 0.89, 0.84, 0.86, and 0.82 respectively.

The maximum values of the variables during the evaluation process were 0.98, 0.97, 0.95, 0.96, and 1.30 for network host detection, port scanning accuracy, vulnerability detection, risk classification, and system scan time respectively.

The standard deviations for each variable indicate that the data values are moderately spread around their respective mean values, showing consistent performance of the vulnerability scanning system.

Column six in Table 4.1 shows the Jarque-Bera test which is used to examine the normality of the collected data. The hypotheses for testing normal distribution are given below:

H_0 : The data is normally distributed.
H_1 : The data is not normally distributed.

Table 4.1 shows that at a **5% level of confidence**, the null hypothesis of normality cannot be rejected. The system performance variables such as network detection accuracy, port scanning accuracy, vulnerability detection, risk classification, and system scan time are therefore considered to be normally distributed.

The descriptive statistics from Table 4.1 indicate that the values are normally distributed around their mean and variance. This suggests that the vulnerability scanning system provides stable and consistent results during testing. The evaluation results demonstrate that the system is capable of accurately identifying network hosts, detecting vulnerabilities, and generating reliable security reports to assist administrators in improving overall network security.

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