Edge Hill University

The Department of Computer Science

System Penetration Testing 2019

Courework

Jakub (Jacob) Strykowski 24325457

TABLE OF CONTENTS

PORTFOLIO 1

AN INTRODUCTION TO INFORMATION GATHERING AND OPEN SOURCE INTELLIGENCE (OSINT)

(Kostadinov, 2016)

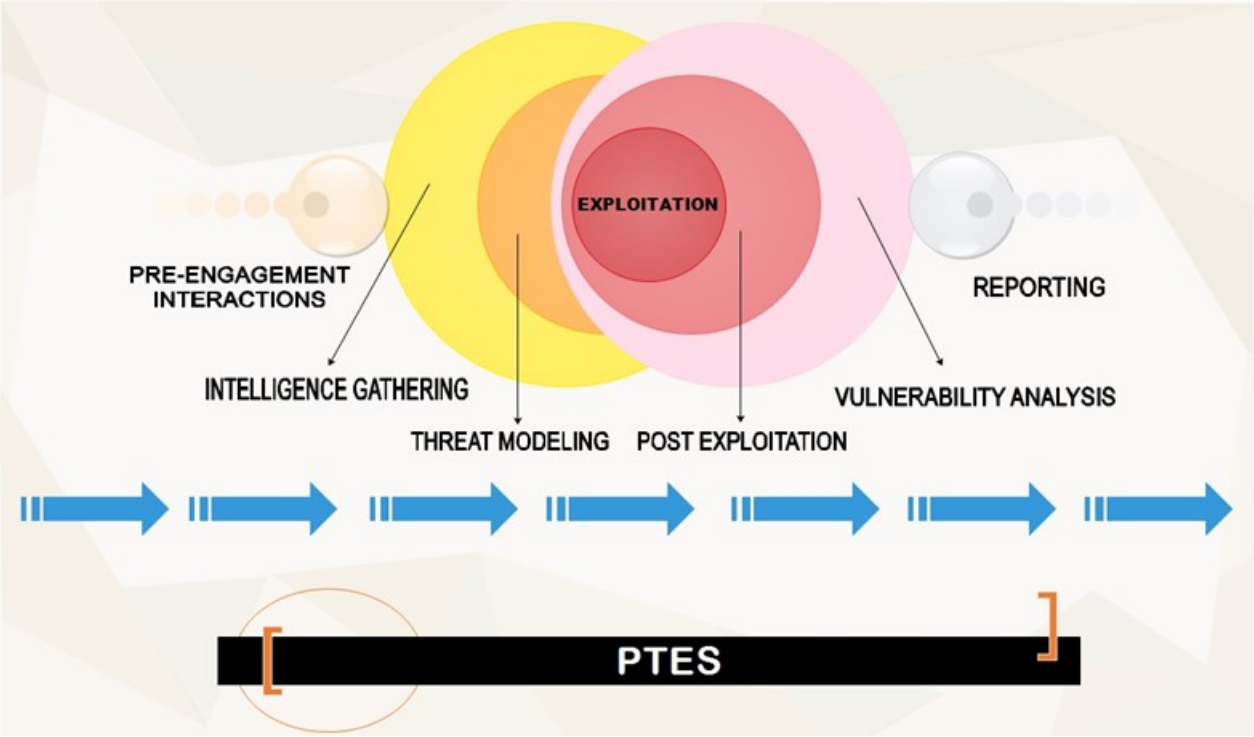


Figure 1

System penetration testing is one of the solutions for problem with cybercrime. Company or individual can hire a system pen tester to validate security of their systems. The process starts from pre-arrangement meeting *(figure 1)* where both sides discuss the goals and limitations. Next step is information gathering, pen tester collects publicly available information about client and looks for data which would helpful in future exploitation of the client's system. Information gathering is crucial for later steps, because without useful information pen tester would not be able to find any vulnerability which are necessity in exploitation of the system (Dimov, 2019).

"Information gathering is not just a phase of security testing; it is an art which every penetration-tester (pen-tester) and hacker should master for a better experience in penetration testing" (https://www.w3schools.in/, nd).

However, more gathered information would obtain by providing more vulnerabilities. Information Gathering can be doing in two ways passive and active. Passive Information Gathering based on information which pen tester can collect without establishing connection with the target (Obbayi, 2019). Pen tester during passive Information Gathering have more time, because victim do not know about being targeting by pen tester. Examples of passive Information Gathering are data about topology of organisation network and types of using services within, but also credentials of personnel which pen tester may use to fishing or blackmail at later date (Ollmann, 2004). Pen tester for passive Information Gathering can use: Google Hacking, the Harvester, Whois or Web Robots (Dimov, 2019). Active Information Gathering require pen tester to establish connection with target, it is a potential

risk for pen tester of being stopped by client's cybersecurity department. Pen tester should carefully scan the target's network to avoid detection by Intrusion Detection System or Security Information and Event Management's tools (Obbayi, 2019). Pen tester to active Information Gathering can use programmes: Nmap, Netcat or SPARTA (nd, nd).

Open source intelligence (OSINT) is a process of intelligence collection, it used data from publicly available sources which produce actionable intelligence (Wikipedia, 2019). The information used to OSINT can be in various forms like text, file, audio, video, image etc (Passi, 2018).

Why do it?

- Determinate various entry points in an organization, which can be physical electronic and/or humans
- Many companies publish information which attacker can use.
- Many employees use social accounts, where they share information which attacker can use to compromise themselves or their employee. The best source of employees' personal information are social media, websites like Facebook, Twitter, LinkedIn etc hold a lot of user data.
- The gather information is published in the internet in many cases for free and everybody can access it unless it is restricted by law or an organization (Passi, 2018).

Why not do it?

- OSINT may be not time-effective
- Gather information might be deliberate or accidentally manipulated.

OSINT forms:

- Passive reconnaissance used only public facing infrastructure, also this form of gathering does not require sending any traffic to target, and pen tester can stay as much as it is possible anonymous. Examples of Passive Information gathering are: OSINT Framework, Google Hacks, theHarvester, Maltego. The cons are time it takes and result with not completed information, of course the information can be gathered in faster way with active scanning, but active scan can be easier detected (CYBERSEC, 2018).
- Semi-passive is form of OSINT where pen tester gathers information using methods which would appear like normal Internet traffic and behaviour. Pen tester cannot use brutal force DNS request or run network level port scan, because during semi passive it is not looking for "unpublished" servers or directors. However, the key here is to be unspotted by target, in that reason pen tester can only looking at metadata in published documents or files (nd, nd). Examples of Semi-Passive Information gathering are Whois, social engineering (Dimov, 2019).
- Active information gathering starting when pen tester actively engaging with target. In this stage pen tester is actively mapping client's network infrastructure, it is looking for 'unpublished' services, files or directories. Active information gathering is largest part of information gathering process, it is called "reconnaissance" or "scanning", the tools used to it are Nmap, Banner Grabbing, Nikto etc.

USE THE TOOLS LISTED BELOW TO GATHER INFORMATION ABOUT YOUR CHOSEN WEBSITE.

1.1.1 GOOGLE SEARCH AND GOOGLE HACKS

The internet is huge part of nowadays live. It allows people to buying things, sharing videos or mailing. The banking system in our society is now online, more and more finical operation is doing online. Users who want to use all services have to fill a valuable credentials. The risk the personal information would been stolen is growing to number of used websites. The hackers can theft money form bank account or hack other services using user's data or even find the place of living. This piece of paper would state how important is personal data security.

Google Search and Google Hack Operator	List of information gathered

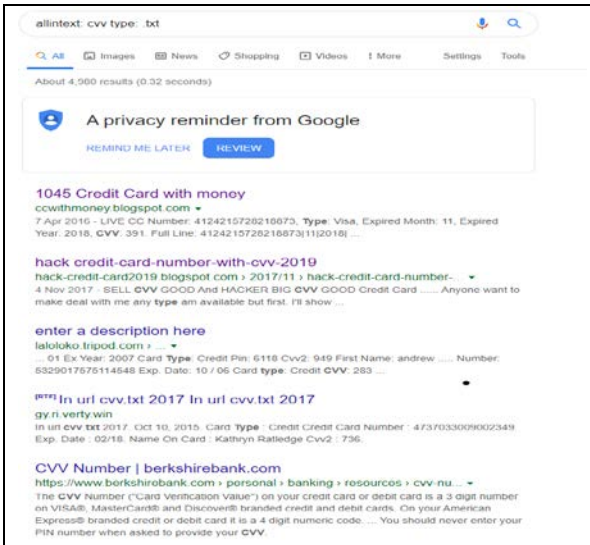
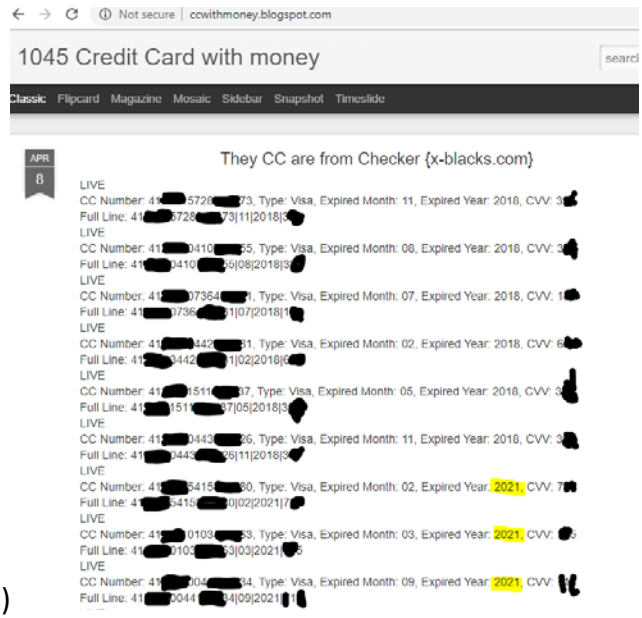


Figure 2



(nd, 2016)

Figure 3

(nd, 2017)

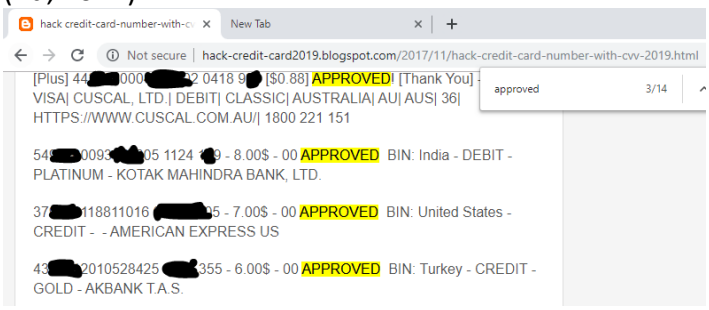


Figure 4

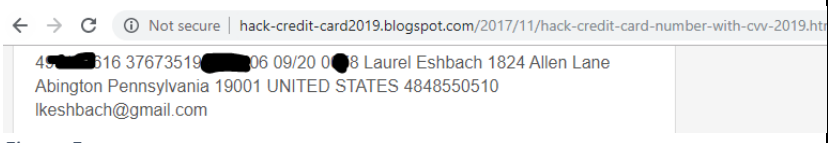


Figure 5

1.1.1.1 allintext: cvv

It results is site with 1045 Credit Card numbers and CVV and a lot of different websites with more result. On hack-credit-card-with-cvv is an information about “approval” this credit card number. Probably not all of these websites are valid, otherwise, a few of record looks quite litigable. (It is not ethical to check those data).

1.1.1.2 Intitle: index of/admin

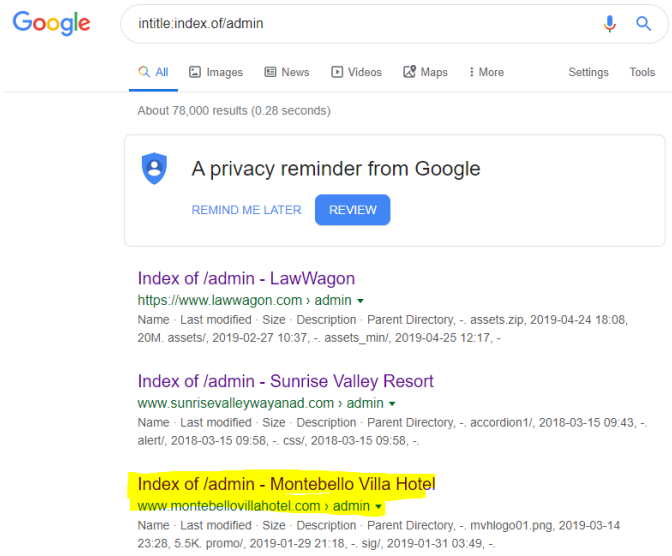


Figure 6

Figure 7

Using of the google hacking operator intitle: allowed to collect the video from cctv upper reception. On screen shot it's highlight information:

- Personal data of client. It would be even fiscal information like credit/debit card number
- Notes for staff, there could be information, about work hours of staff, files, or even password
- Third is the computer view. It would be able to consider what software company is using. There screen of computer can give access to private company information

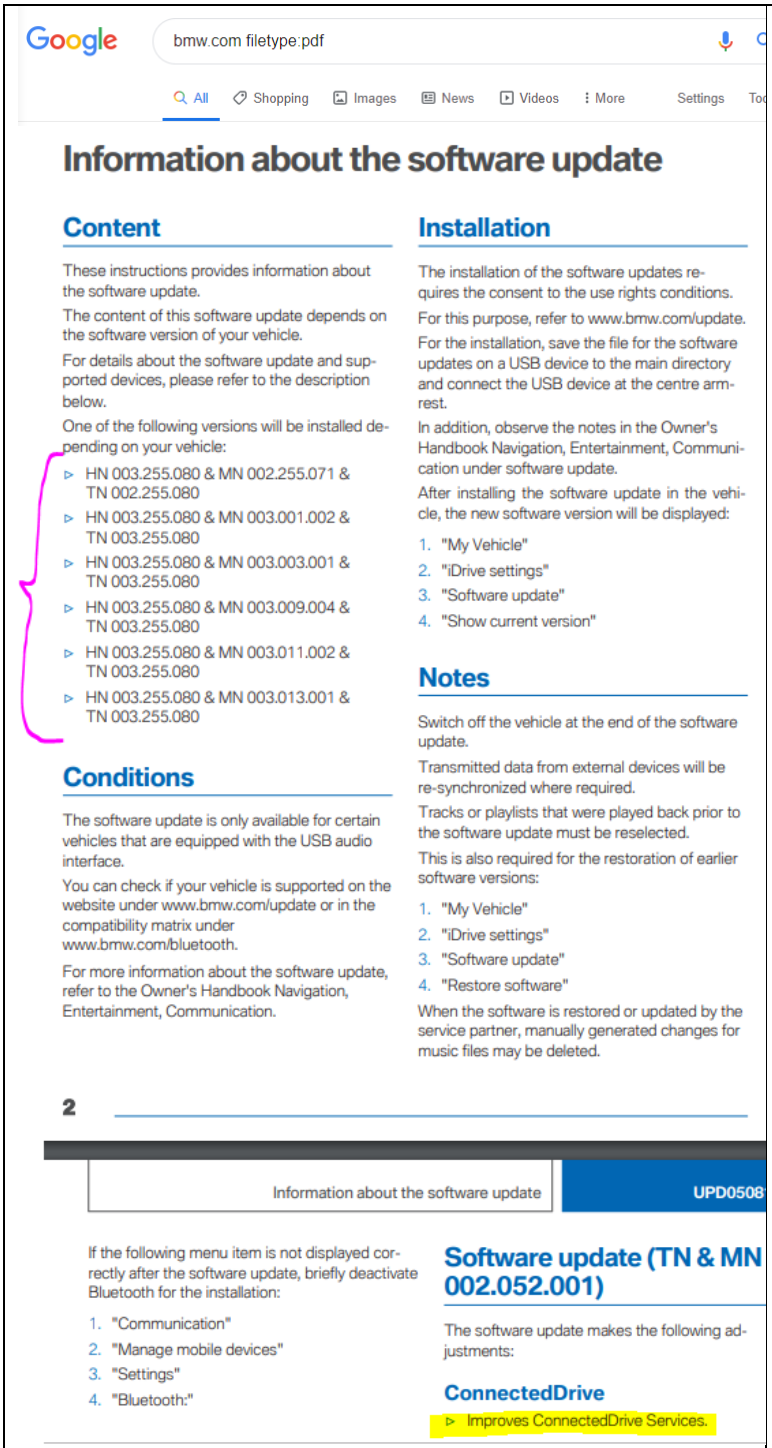
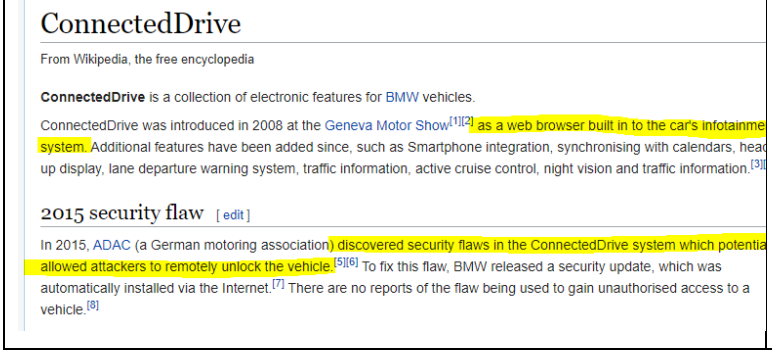


Figure 8

(Wikipedia, 2018)



1.1.1.3 filetype

After using operator 'filetype' I found the file with information about software update(figure8). I checked what is Improves Connected Drive Service. On Wikipedia it paragraph about flaws which is potentially risky for this system. (2015) The file is from 2018, but this volubility can be not update in cars without access to the internet. The car owners have to install update manually, it can be seemed that a few people did not download it. The cars with this system can connecting with smartphone it could be different way to hack this system. Additionally, this system is important for safety of car users (figure9):

- lane departure warning system
- active cruise control
- night vision

The hackers who break into this system can blackmail BMW and demand considerable money for not using it. The application of allintext is scan text to search input phrase. In this case it was used to find information about Security updated in BMW company. The result is page containing

Figure 9

(BMW, 2018)

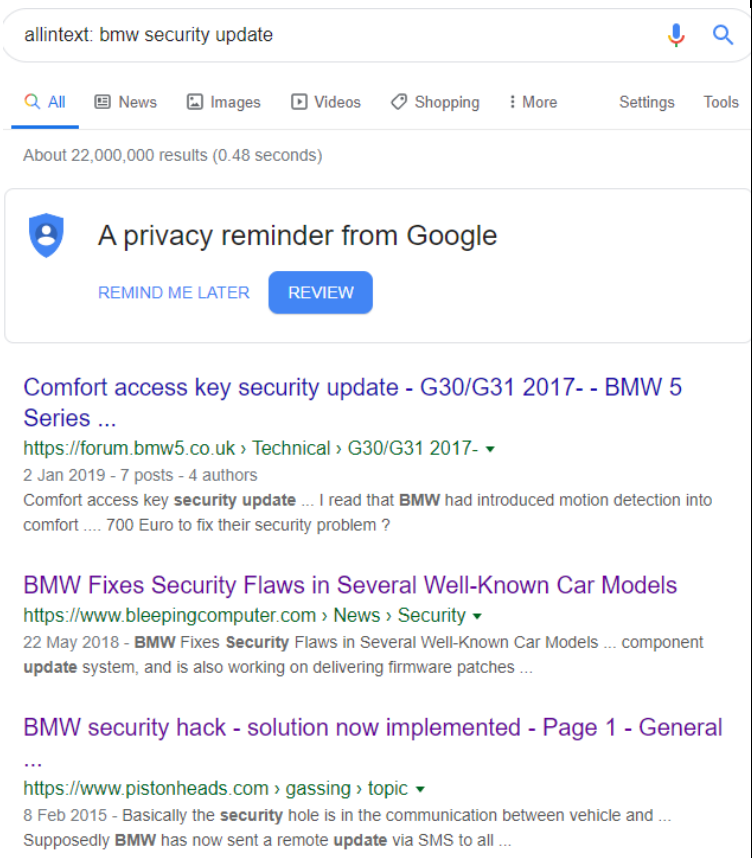
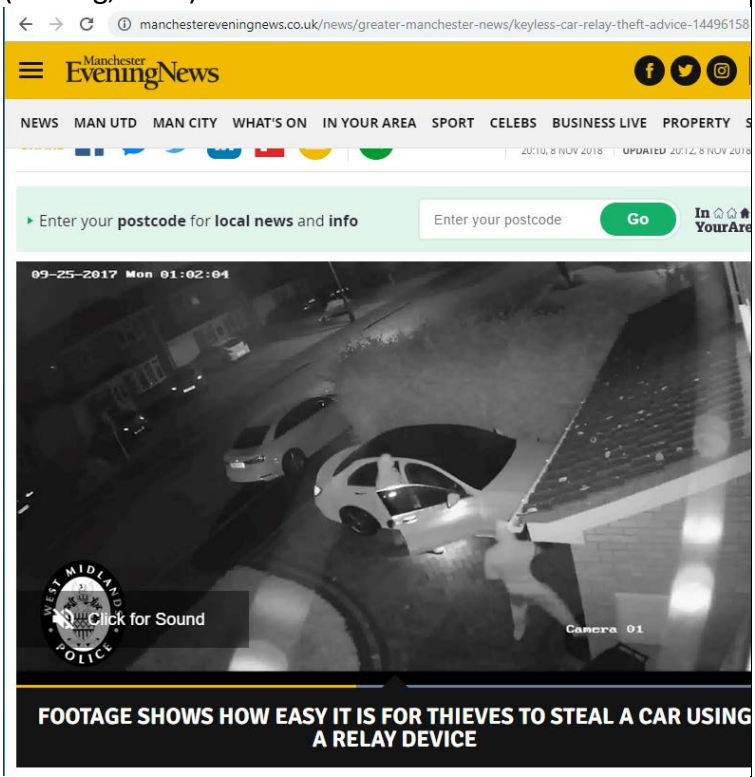


Figure 10

(Keeling, 2018)



information regarding lack in car security. There is a brief description and list of cars with that vulnerability.

Figure 11

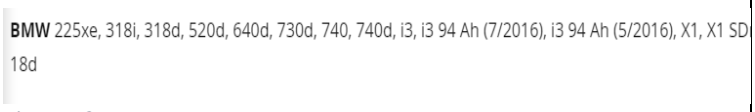


Figure 12

1.1.1.4 Lauren Eshbach, allintext

1824 Allen lane Abington pa 19001
allintext:2156574817

(nd, n.d.)

Figure 13

(nd, 2018)

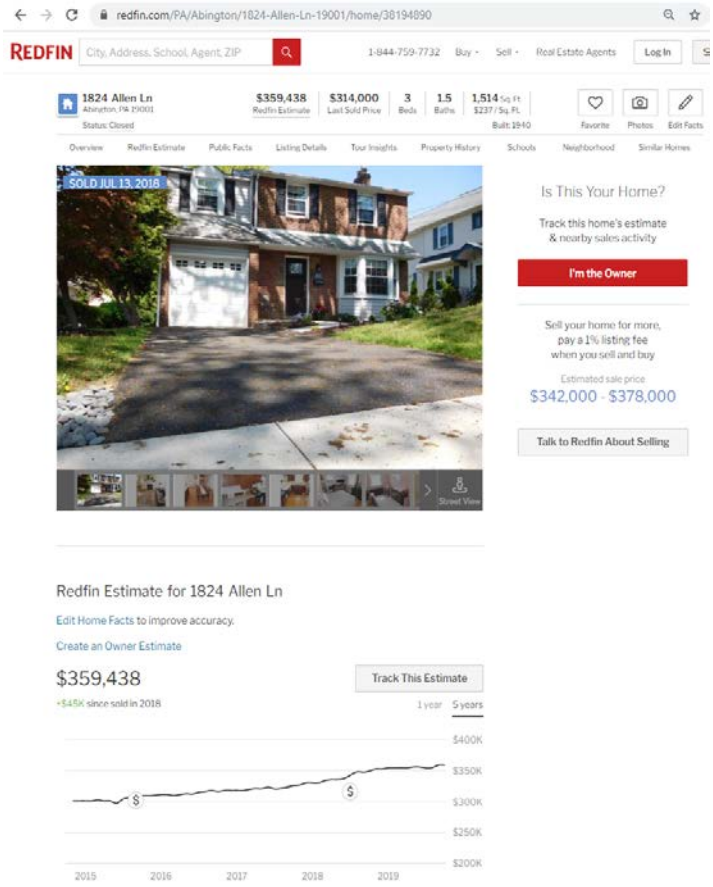


Figure 14

In previous example is record with name and credit card. The person who lose the credit card detail is suspect for being obvious target for gather more information.

- Using the address can give more information. The house was sold in 2018(figure14).First information is that the target has money after selling the house, otherwise, He is still in telephone Dictionaries perhaps he lives there until now. Both scenarios give attackers a lot valuable information.
- In google graphic (figure17) is two pictures as a result for search “Lauren Eshbach”. The consideration is not basic which one is the target, although pictures in bed room (figure18) signalize person with white skin. The same pictures also give a detail about family, the

(nd, 2018)

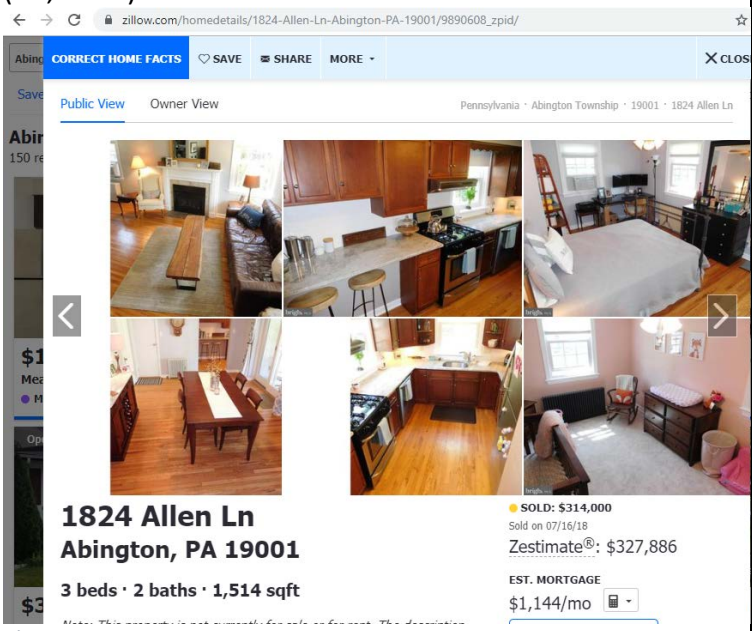


Figure 15

(Eshbach, nd)

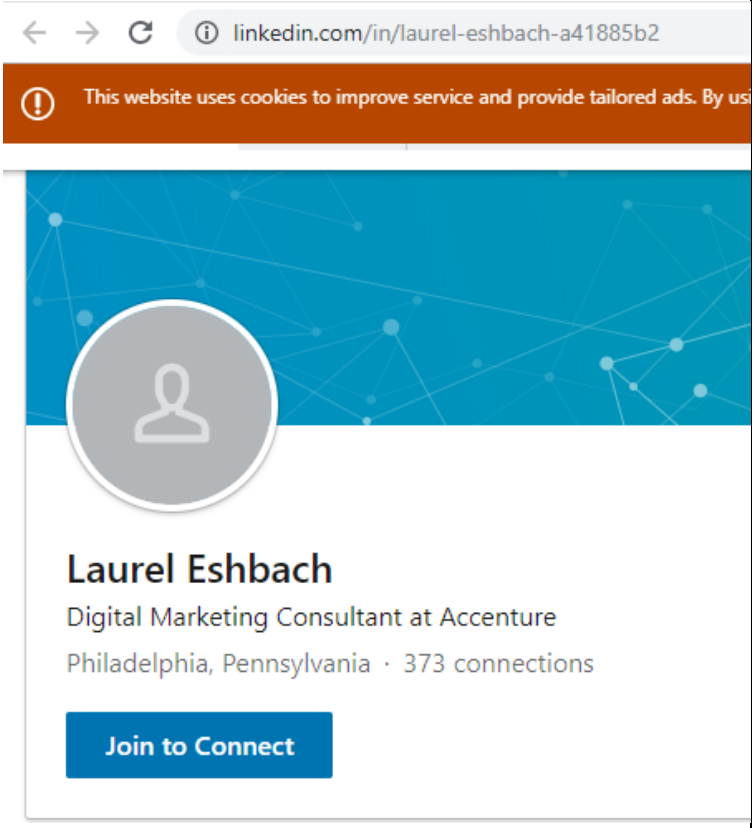


Figure 16

Lauren may have wife and daughter. Also, a box under the desk is containing cables, headphones this is next confirmation that this is real photo of Lauren. (figure15)

- Only one person with this name and address have LinkedIn account(figure16)

(nd, nd)

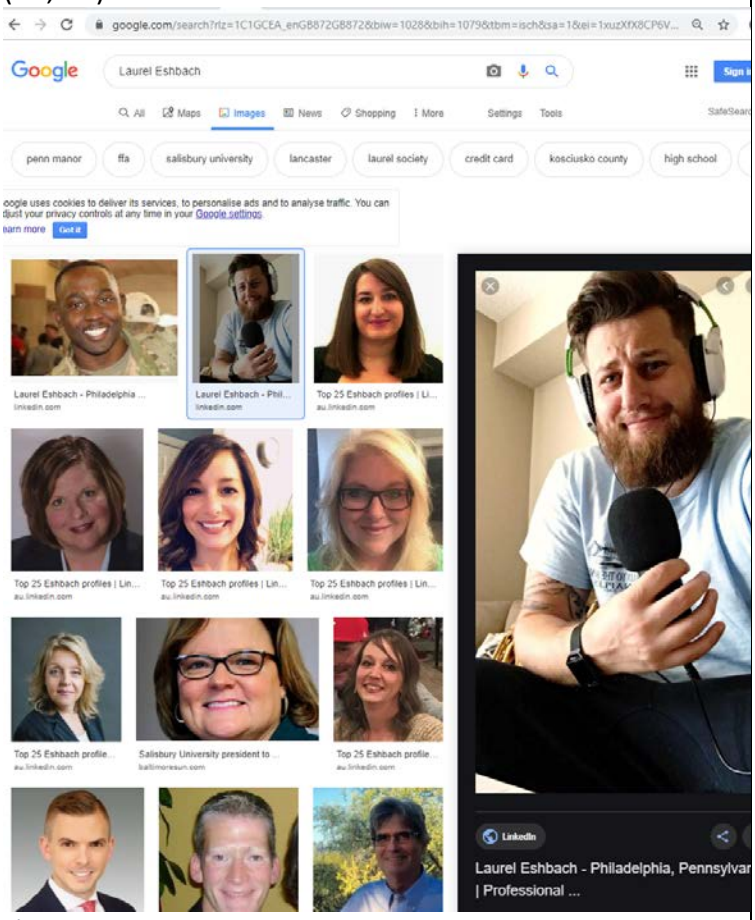
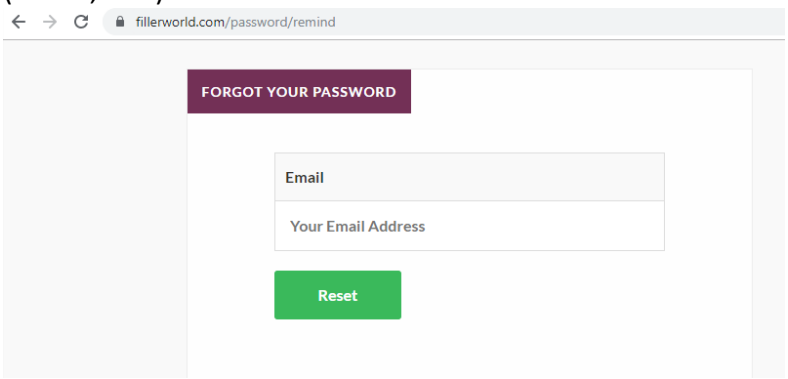


Figure 17

Figure 18

1.1.1.5 site:/password/remind*	
(Anon., n.d.)  *Figure 19*	If attacker penetrated an email address, it can use this formula to magnify its privilege and get access to different websites.

(Reference: http://www.mrjoeyjohnson.com/Google.Hacking.Filters.pdf)

1.1.2 Google Hacking - Conclusion

The Google search is a powerful tool which allow users to find immeasurable amount of information. The fact the hackers also use it is not surprising. The google hack is a tool, which can be used to footprinting. It makes all leaks of date even more dangers for costumers comprised services. The crucial information is shared online by intruders or even people public sensitive data on social medias. Attackers can used information published online to prepare theft. An example presents the data collected using google hack command 'allintext: 'ccv' '. In white next on first page of result can be find lists credit card with note about true validity checked by datasheet author.

1.1.3 Whois

1.1.3.1 WHOIS example_1

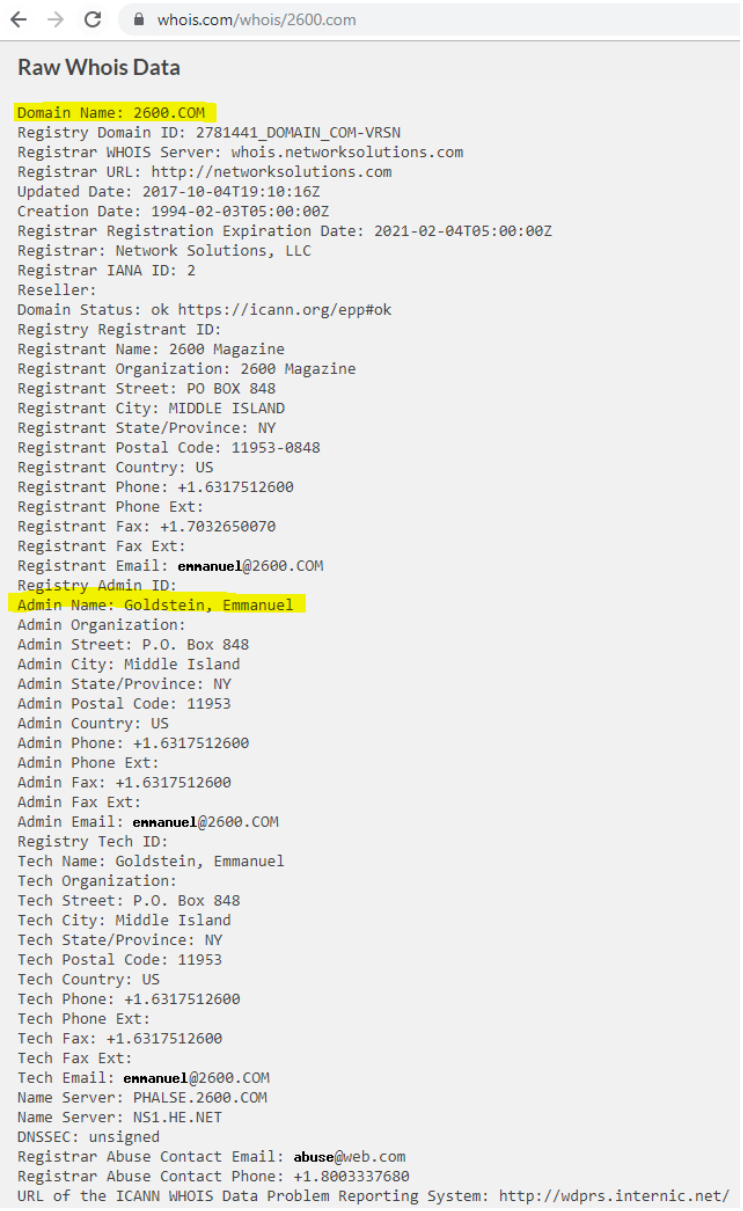


Figure 21

In this exercise a target is website 2600.com(figure20). The selection this website is based on fact that the company has public index of secret containing pictures and articles about “secret service” *(figure 22)* and has online store *(figure 23)* with payment. This composition seems to be dangerous for personal information of costumers.

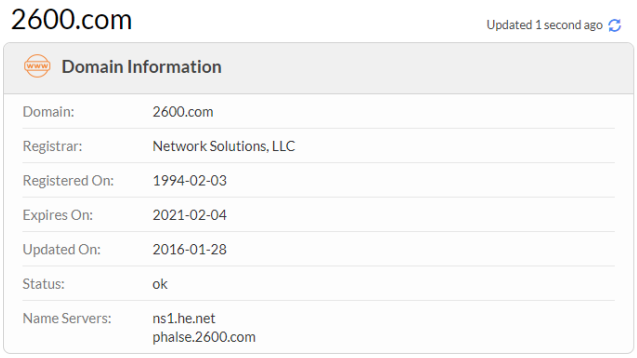


Figure 20

Figure 22

List of information gathered example_1

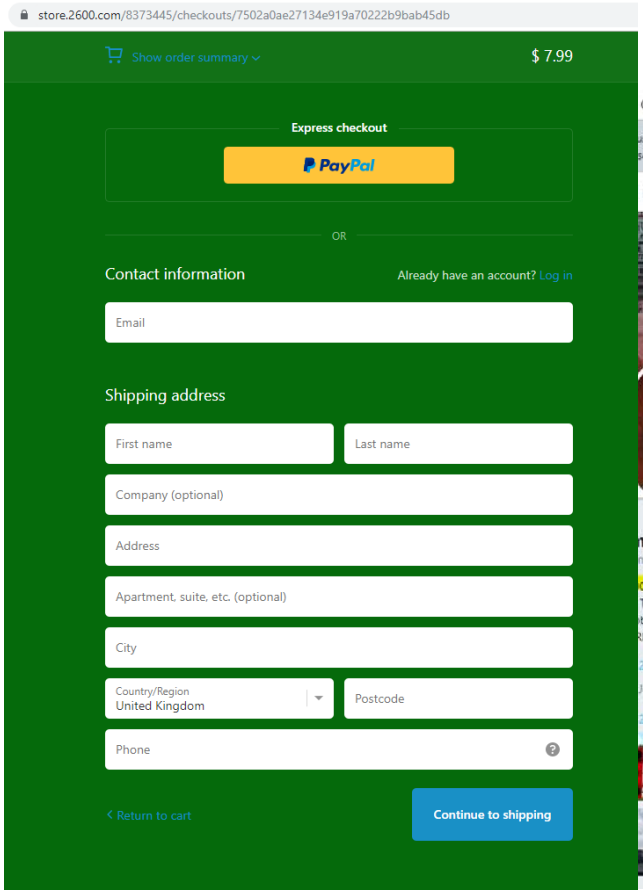


Figure 23

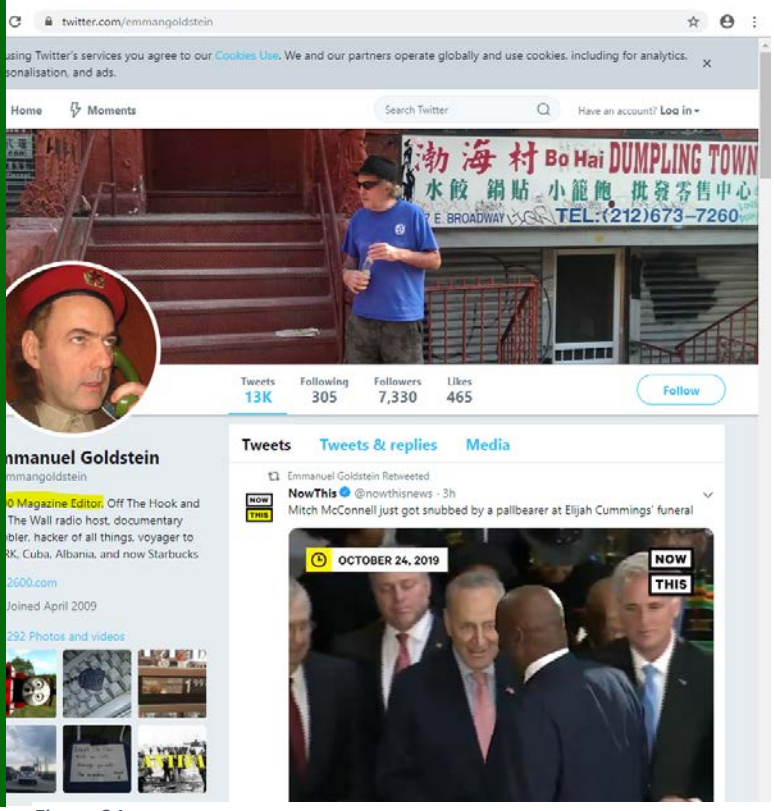
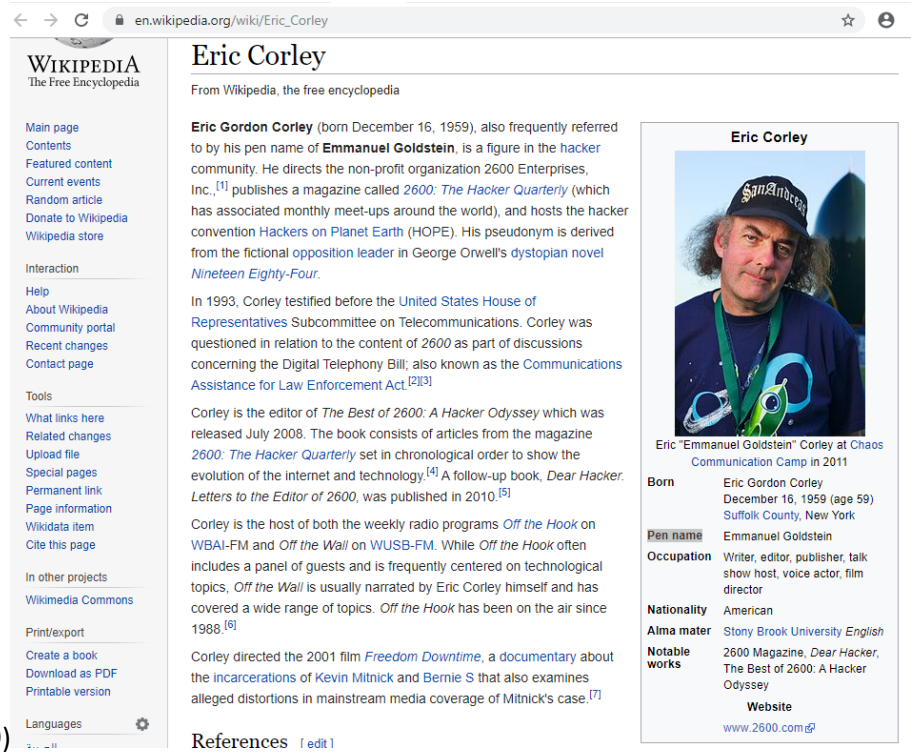


Figure 24

The most important is to gather information is administrator's credential(figure24). Those data might be helpful to break the password and get access to databased with clients' information.



(wikipedia, 2019)

Figure 25

The suspicion was not equivalent because the targeted admin is the well-known hacker *(figure 25)* and attacking his website does no seemed to be cost-effective.

1.1.3.3 WHOIS example 2

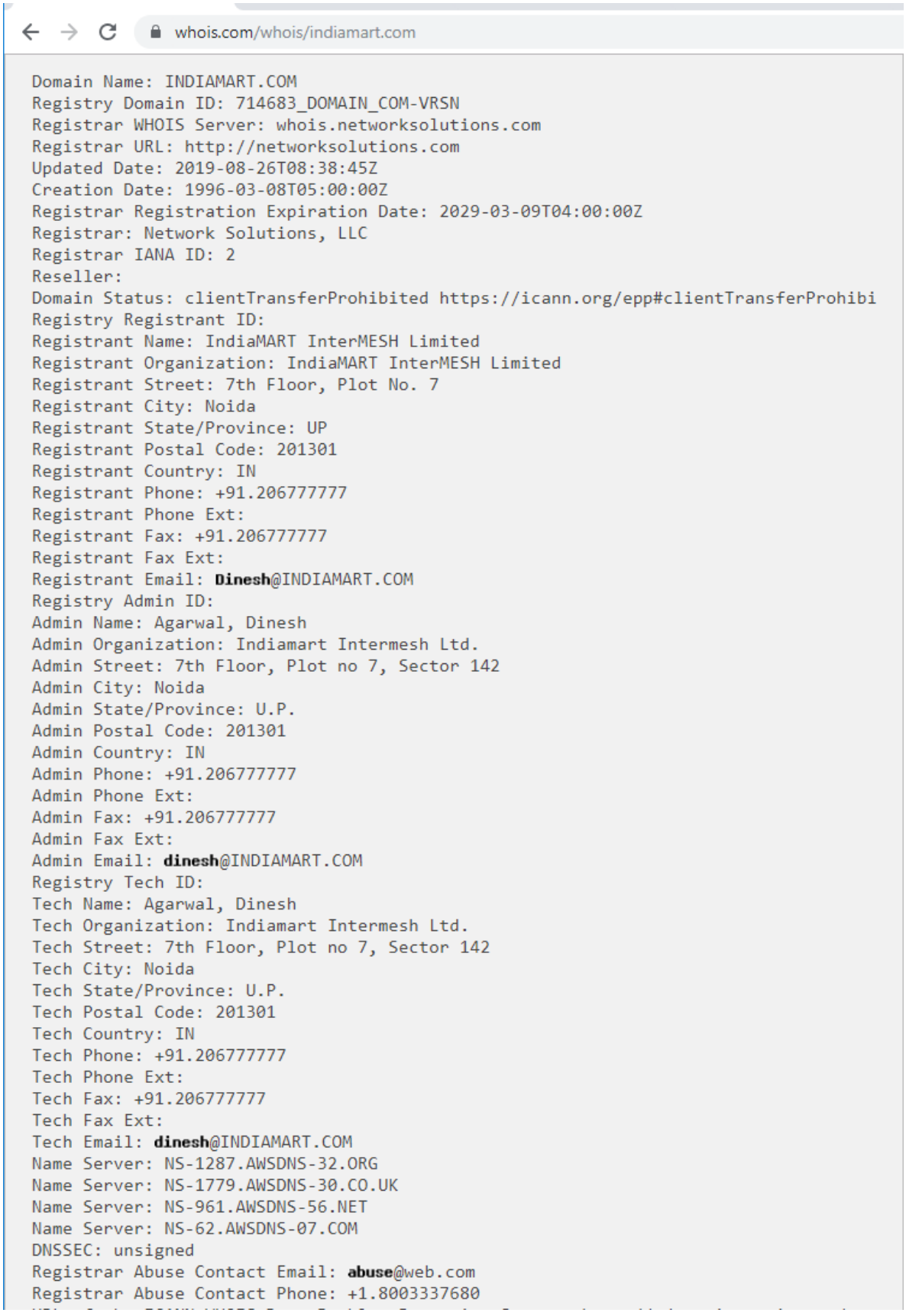


Figure 26

Form figure 25 can be read information about company called IndiaMART, figure 26 shows: company's address, admin's email and phone number. The information about admin can be used in process of footprinting. Also, data about company address can help with active information gathering.

1. WEB ROBOTS

Website developers used robots.txt to give instruction about their site to web robots (The Robots Exclusion Protocol). There are two standards for files “User-agent: *” what means everybody can access it and ‘Disallow: / ‘ what means robot should not have access to this file. However, the malicious robots can ignore it and access this file, because this file is shared online. (Reference: http://www.robotstxt.org/robotstxt.html)

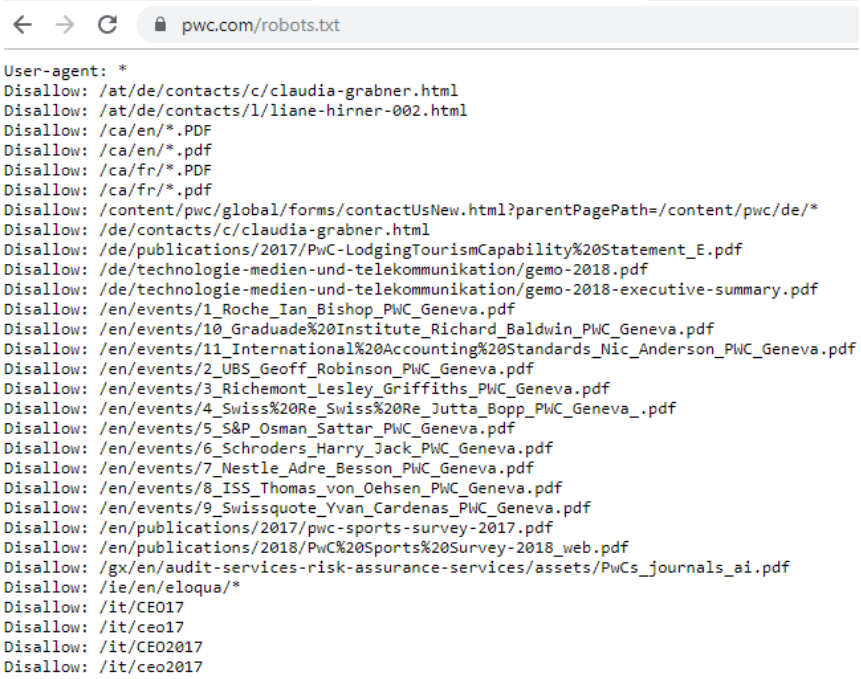


Figure 27

Figure 27 shows a lot of disallowed files which can contain important on information for example about CEO as can be seen on the bottom of figure.

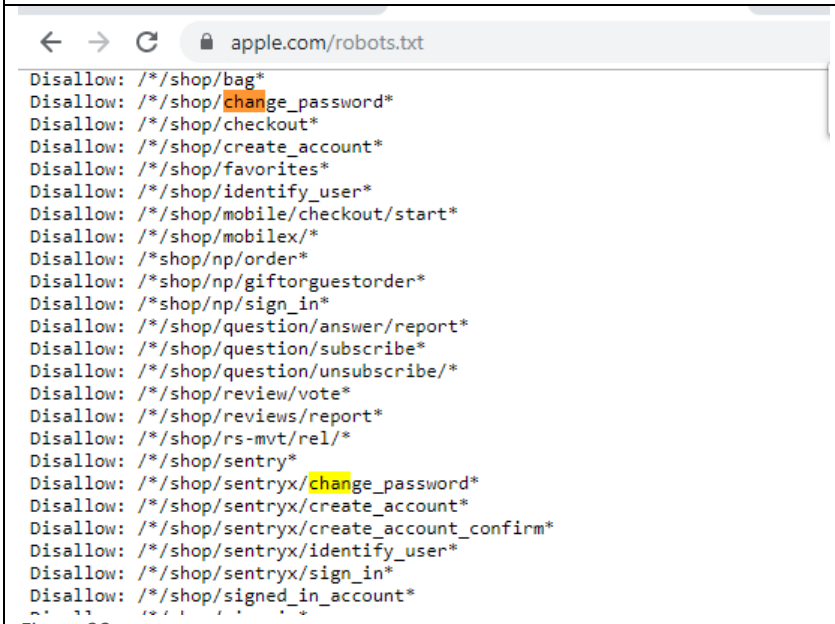


Figure 28

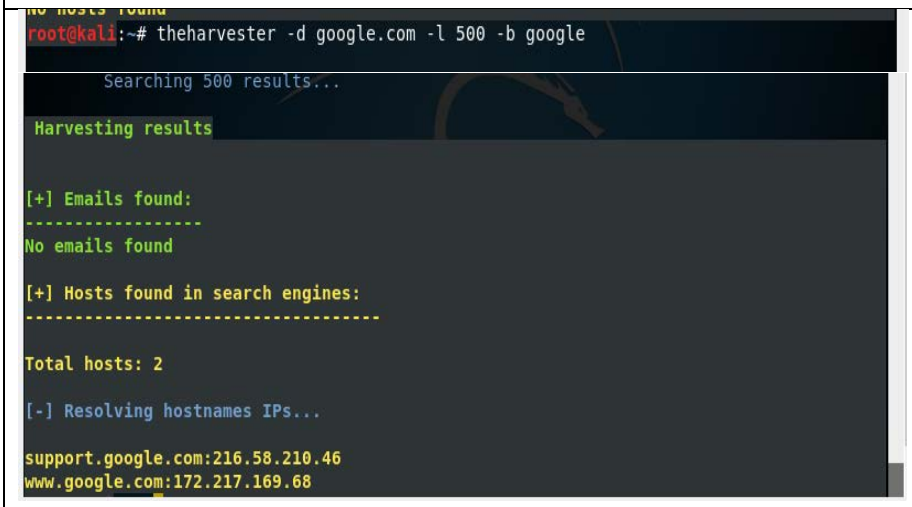
Figure 28 shows a lot of disallowed files which might contain crucial for security of website information, for example files with changes in password politics. Hackers can used this information to prepare the attack, an important facts is that apple.com has an online shop and hackers might steal finical information of users.

2. EMAIL HARVESTER (theharvester):

(Reference: https://tools.kali.org/information-gathering/theharvester)

Theharvester is tool used in passive information gathering, it is gathering information published online like emails, subdomains, host, employee names, open ports. It is preinstalled on Kali Linux and is helpful in first part of gathering process when pen tester and be as quiet as it is possible, in that reason should not connect to client.

theharvester	List of information gathered
 *Figure 29*	From figure 29 can be read data about services which are provided by Microsoft. Also, the harvester search result with ip port addresses which might be used in active gathering information where are used net scanners like Nmap. An example of result is developer.microsoft.com with ip address 23.55.30.212.

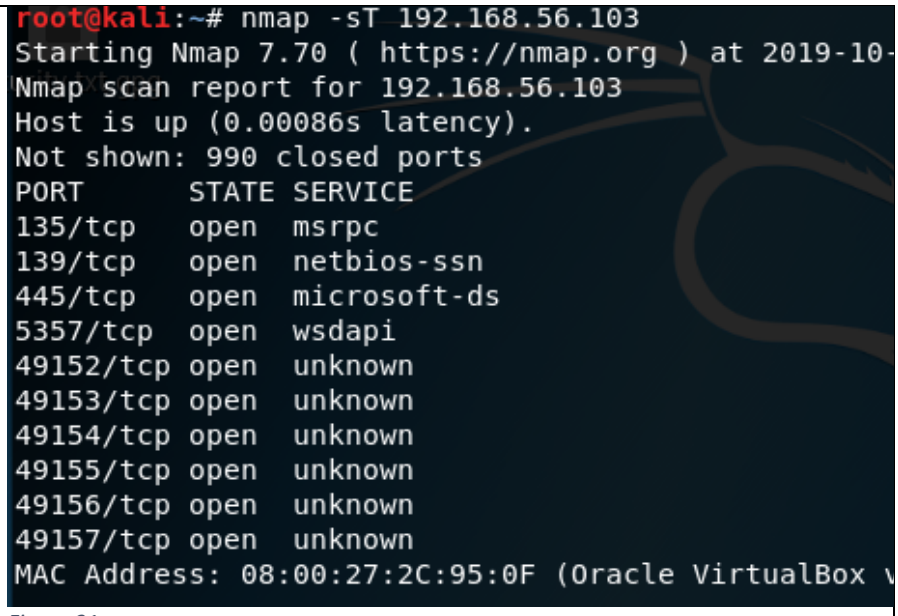
theharvester	List of information gathered
 *Figure 30*	Figure 30 resulted with website addresses and ip addresses of those websites. There are not any emails and just two websites: support.google.com with ip address 216.58.210.46 and www.google.com with ip address 172.217.169.68

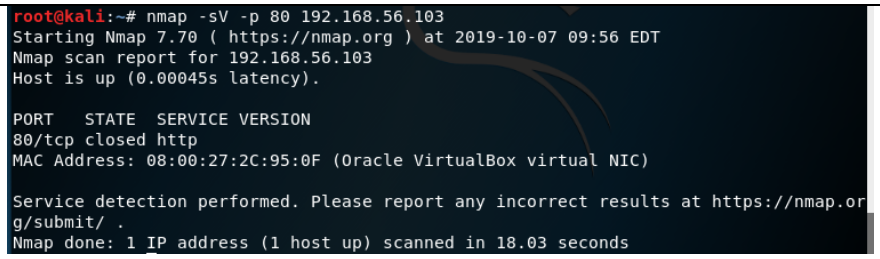
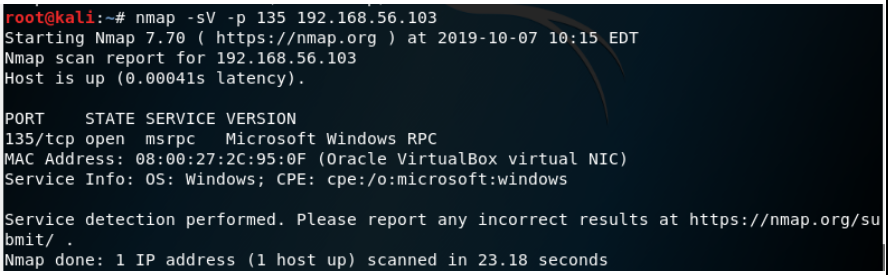
3. NMAP

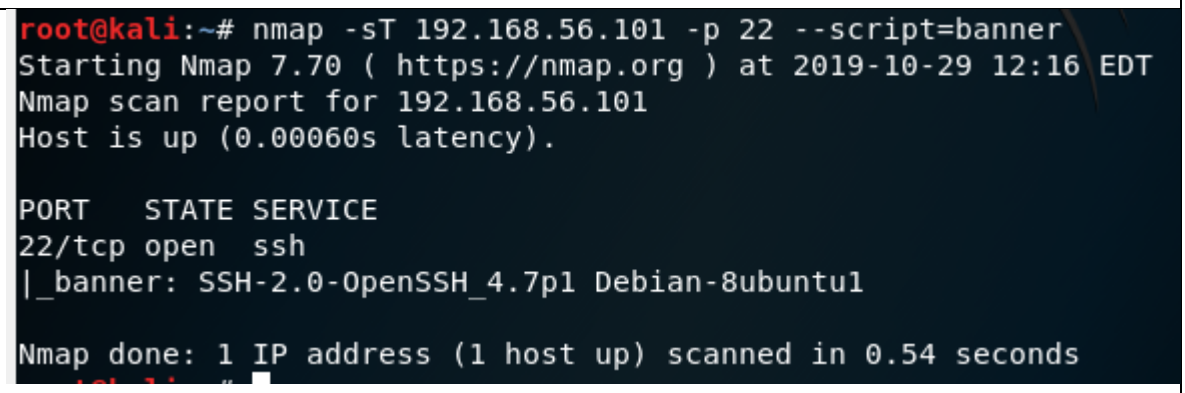
Nmap or the full name is 'Network scanner', it is a free and open source network scanner created by Gordon Lyon (wikipedia, 2019; nd, nd). Pen testers use Nmap for task as network inventory, managing services upgrade schedules, and monitoring host or service uptime. Nmap is so popular even it was used in twelve movies one of them was The Matrix Reloaded, the popularity of this tool cause large user support community (nd, nd). An example of standard scan is "nmap -sV [target's ip address]" and If pen tester uses Kali Linux, it does not need to install Nmap because Nmap is pre-installed. Nmap is simple for new user to star it out because to run a command in terminal is just needed to write "nmap", settings and target's ip address. Nmap is command line based, otherwise there are also programmes which add graphic user interface to nmap for example Zen map. One of the Nmap advantages is portability, because most operating system are supported, for example Linux, Microsoft Windows and Mac Os. Nmap can scan thousands of machines, in that reason it can be used to build topology of huge networks.

Nmap has a few useful features:

1. Active port scanning
2. Host discovery
3. OS detection
4. Application version detection

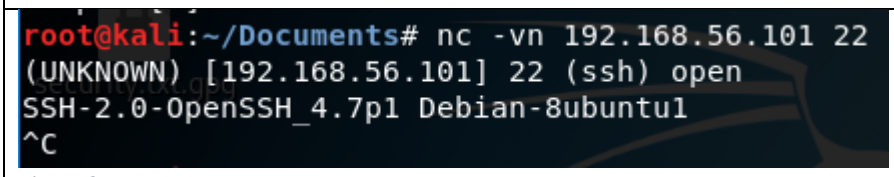
NMAP	 *Figure 31*
List of information gathered	The operation nmap – sT 192.168.56.103 show us list of open ports on this ip address. Command -sT use TCP connection for gather information, it can be useful when firewall block UDP connection.

NMAP	 *Figure 32*  *Figure 33*
List of information gathered	This port 80 is web service port and it is closed (figure32). The port 135 is open, it is possible to get system information and name of software working on that computer (figure33). In this case of port 135 the operation system is Windows

List of information gathered	
	 *Figure 34* Banner script is used to collected information during five-second-long TCP connection with targeted ip address and/or port of it. The script is available at: https://github.com/nmap/nmap/blob/master/scripts/banner.nse. Figure 34 shows 'banner' : SSH-2.0-OpenSSH_4.7p1 Debian-8ubuntu1 and information about service: ssh and port is open.

4. BANNER GRABBING – NETCAT

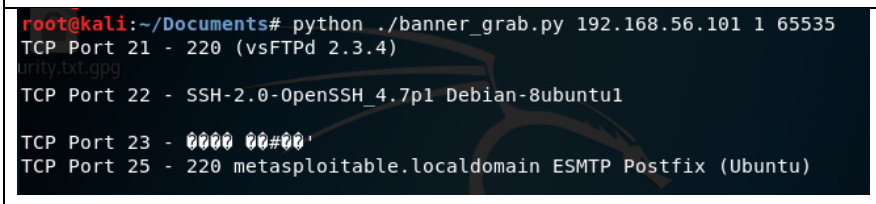
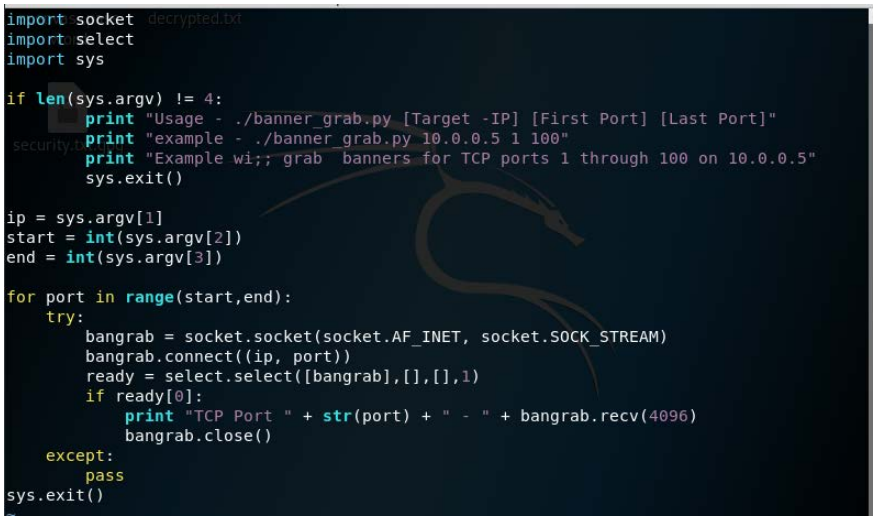
Netcat is program used to monitor the flow of data between systems. The history of this tool started in 1995. It support TCP and UDP transfer protocols and can be compation of WireShark.

Netcat	List of information gathered
 *Figure 35*	-vn flag in netcat is used to basic scanning of port, or port port 22 can be changed to list of ports. The result (figure35) is name of service and version of it: SSH-2.0 - openSHH_47p1 Debian Ubutnu1

Netcat	List of information gathered
 *Figure 36*	Figure 35 shows the basic netcat scan ip address (figure36) 192.168.56.101 and targeted port is 22. Gather information is that port 21 is open.

5. YOUR CHOICE OF INFORMATION GATHERING TOOL OR COMMAND OR SOFTWARE

1.5.1 Python

Tool	List of information gathered
 *Figure 37*  *Figure 38*	It is using python repository called banner grab where with list of vulnerabilities. Python script make scanning easier for pen tester, because it do scan automatically . On figure 37 are result of scan 192.168.56.101 and port range 1 65535. It can be seen the port 22 is running Debian-8ubuntu1 or port 25 is metasploitable.

```
import socket
import select
import sys

if len(sys.argv) != 4:
        print "Usage - ./banner_grab.py [Target -IP] [First Port] [Last Port]"
        print "example - ./banner_grab.py 10.0.0.5 1 100"
        print "Example wi;; grab  banners for TCP ports 1 through 100 on 10.0.0.5"
        sys.exit()

ip = sys.argv[1]
start = int(sys.argv[2])
end = int(sys.argv[3])

for port in range(start,end):
    try:
        bangrab = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
        bangrab.connect((ip, port))
        ready = select.select([bangrab],[],[],1)
        if ready[0]:
            print "TCP Port " + str(port) + " - " + bangrab.recv(4096)
            bangrab.close()
    except:
        pass
sys.exit()
```

1.5.2 Nmap

In this paragraph I will present basic Nmap's tools which are popular way to gather information.

1.5.2.1 Active port scanning

```
root@kali:~# nmap 192.168.56.105
Starting Nmap 7.70 ( https://nmap.org ) at 2019-12-02 09:06 EST
mass_dns: warning: Unable to determine any DNS servers. Reverse D
servers
Nmap scan report for 192.168.56.105
Host is up (0.000098s latency).
Not shown: 978 closed ports
PORT     STATE SERVICE
21/tcp   open  ftp
22/tcp   open  ssh
23/tcp   open  telnet
25/tcp   open  smtp
53/tcp   open  domain
80/tcp   open  http
111/tcp  open  rpcbind
139/tcp  open  netbios-ssn
445/tcp  open  microsoft-ds
512/tcp  open  exec
513/tcp  open  login
514/tcp  open  shell
1099/tcp open  rmiregistry
1524/tcp open  ingreslock
2049/tcp open  nfs
3306/tcp open  mysql
5432/tcp open  postgresql
5900/tcp open  vnc
6000/tcp open  X11
6667/tcp open  irc
8009/tcp open  ajp13
8180/tcp open  unknown
MAC Address: 08:00:27:55:8B:8F (Oracle VirtualBox virtual NIC)

Nmap done: 1 IP address (1 host up) scanned in 0.21 seconds
```

Figure 39

1.5.2.2 Host discovery

-Pn (No PING) Nmap suggested this command in case of Sophos' firewall.

```
root@kali:~# nmap -Pn 192.168.56.105
Starting Nmap 7.70 ( https://nmap.org ) at 2019-12-02 09:15 EST
mass_dns: warning: Unable to determine any DNS servers. Reverse DNS is disabled.
servers
Nmap scan report for 192.168.56.105
Host is up (0.00011s latency).
Not shown: 978 closed ports
PORT     STATE SERVICE
21/tcp   open  ftp
22/tcp   open  ssh
23/tcp   open  telnet
25/tcp   open  smtp
53/tcp   open  domain
80/tcp   open  http
111/tcp  open  rpcbind
139/tcp  open  netbios-ssn
445/tcp  open  microsoft-ds
512/tcp  open  exec
513/tcp  open  login
514/tcp  open  shell
1099/tcp open  rmiregistry
1524/tcp open  ingreslock
2049/tcp open  nfs
3306/tcp open  mysql
5432/tcp open  postgresql
5900/tcp open  vnc
6000/tcp open  X11
6667/tcp open  irc
8009/tcp open  ajp13
8180/tcp open  unknown
MAC Address: 08:00:27:55:8B:8F (Oracle VirtualBox virtual NIC)

Nmap done: 1 IP address (1 host up) scanned in 0.30 seconds
```

Figure 40

1.5.2.3 OS detection

```
root@kali:~# nmap -O 192.168.56.105
Starting Nmap 7.70 ( https://nmap.org ) at 2019-12-02 09:08 EST
mass_dns: warning: Unable to determine any DNS servers. Reverse D
servers
Nmap scan report for 192.168.56.105
Host is up (0.00032s latency).
Device type: general purpose
Running: Linux 2.6.X
OS CPE: cpe:/o:linux:linux_kernel:2.6
OS details: Linux 2.6.9 - 2.6.33
Network Distance: 1 hop
```

Figure 41

1.5.2.4 Application version detection

```
root@kali:~# nmap -sV 192.168.56.105
Starting Nmap 7.70 ( https://nmap.org ) at 2019-12-02 09:11 EST
mass_dns: warning: Unable to determine any DNS servers. Reverse DNS is disabled. Try usin
servers
Nmap scan report for 192.168.56.105
Host is up (0.00017s latency).
Not shown: 978 closed ports
PORT     STATE SERVICE     VERSION
21/tcp   open  ftp         vsftpd 2.3.4
22/tcp   open  ssh         OpenSSH 4.7p1 Debian 8ubuntu1 (protocol 2.0)
23/tcp   open  telnet      Linux telnetd
25/tcp   open  smtp        Postfix smtpd
53/tcp   open  domain      ISC BIND 9.4.2
80/tcp   open  http        Apache httpd 2.2.8 ((Ubuntu) DAV/2)
111/tcp  open  rpcbind     2 (RPC #100000)
139/tcp  open  netbios-ssn Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
445/tcp  open  netbios-ssn Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
512/tcp  open  exec        netkit-rsh rexecd
513/tcp  open  login       OpenBSD or Solaris rlogind
514/tcp  open  shell       Netkit rshd
1099/tcp open  rmiregistry GNU Classpath grmiregistry
1524/tcp open  bindshell   Bash shell (**BACKDOOR**; root shell)
2049/tcp open  nfs         2-4 (RPC #100003)
3306/tcp open  mysql       MySQL 5.0.51a-3ubuntu5
5432/tcp open  postgresql  PostgreSQL DB 8.3.0 - 8.3.7
5900/tcp open  vnc         VNC (protocol 3.3)
6000/tcp open  X11         (access denied)
6667/tcp open  irc         UnrealIRCd
8009/tcp open  ajp13       Apache Jserv (Protocol v1.3)
8180/tcp open  http        Apache Tomcat/Coyote JSP engine 1.1
MAC Address: 08:00:27:55:8B:8F (Oracle VirtualBox virtual NIC)
Service Info: Hosts:  metasploitable.localdomain, localhost, .metasploit.metasploitable,
/o:linux:linux_kernel
```

Figure 42

CONCLUSION AND LIST OF REFERENCES

A lot of important information companies or person publish online. In one example using passive information gathering I was able to gather information about card number, address, company and family structure, all that information was available online, everybody can use it. Otherwise, the main work of pen tester is active information gathering, the popularity of tools like nmap can be compare to medium known actor who played in twelve movies. Free tutorial on web or YouTube are crucial in self-education process, in this way the OSINT helps pen testers to improve ways collecting information, by giving them possibility to boost their skills.

References Portfolio 1

Anon., n.d. [Online]
Available at: https://www.fillerworld.com/password/remind

BMW, 2018. *NFORMATION.* [Online]
Available at:
https://static.bmw.com/content/dam/bmw/staticContent/static_bmw_com/bluetooth/updates/bmw/pdf/Readme_UPD05081_en.pdf
[Accessed 21 19 2019].

Eshbach, L., nd. *www.linkedin.com.* [Online]
Available at: https://www.linkedin.com/in/laurel-eshbach-a41885b2
[Accessed 06 12 2019].

Keeling, N., 2018. *Thieves are 'hacking' keyless cars. These are the models at risk - and the simple thing you can do to protect yourself.* [Online].

nd, 2016. *They CC are from Checker {x-blacks.com}.* [Online]
Available at: http://ccwithmoney.blogspot.com/
[Accessed 25 10 2019].

nd, 2017. *hack credit card number with -cvv-2019.* [Online]
Available at: http://hack-credit-card2019.blogspot.com/2017/11/hack-credit-card-number-with-cvv-2019.html
[Accessed 25 October 2019].

nd, 2018. *1824 Allen Ln.* [Online]
Available at: https://www.zillow.com/homedetails/1824-Allen-Ln-Abington-PA-19001/9890608_zpid/
[Accessed 05 12 2019].

nd, 2018. *Redfin Estimate for 1824 Allen Ln.* [Online]
Available at: https://www.redfin.com/PA/Abington/1824-Allen-Ln-19001/home/38194890
[Accessed 05 12 2019].

nd, n.d. *Telephone Directory of.* [Online].

nd, nd. *google.com.* [Online]
Available at:
https://www.google.com/search?rlz=1C1GCEA_enGB872GB872&biw=1028&bih=1079&tbm=isch&sa=1&ei=1xuzXfX8CP6V1fAP4uud6AQ&q=Laurel+Eshbach&oq=Laurel+Eshbach&gs_l=img.3...1569.1569..2312...0.0..0.44.44.1.....0....1..gws-wiz-img.GHrUu7deWcc&ved=0ahUKEwi1xL7c47flAh
[Accessed 06 12 2019].

Wikipedia, 2018. *https://en.wikipedia.org/.* [Online]
Available at: https://en.wikipedia.org/wiki/ConnectedDrive

wikipedia, 2019. *Eric Corley.* [Online].

PORTFOLIO 2

TECHNICAL REPORT VULNERABILITY ASSESSMENT - INTRODUCTION

Vulnerability assessment is an important step in system penetration testing. Pen tester need to assent gathered information because it wants vulnerabilities which can be exploited at later date. Nowadays, software and hardware rapidly change in that reason, companies produce a lot of updates and add new features to their products. Otherwise, today's update for yesterday's bugs is new opportunity for hacker to break into victim's system, also it can be seemed like an endless fight because tomorrow producent will publish new updates. Updates make changes in software, if developers did not enough test new update, it would make application unstable or vulnerable. For hackers each new line of code in application, which is changed in configurations or new hardware, is other opportunity to hack security system (CVE Team , 2019).

In the other hand, people use computer devices because they like to connect the internet, in that reason the devise need to provide online services. Also, they like to have many new applications for work or entertainment. The security of users is in cyber security specialists' hands. Like a policeman, cybersecurity specialist every day wakes up and starts new battle with cybercriminals. This is one huge never-ending war between white and red hats, because each day new vulnerabilities are found. Hackers theft a lot of money, in 2017 they stale more than 172.000.000.000$ (Condliffe, 2018). They are very motivated and well-paid and will do everything to steal more. They are buying new hardware and testing all new feature in applications, even more they are organized like international enterprises (sophos, nd). The cybersecurity specialists must start preparing for it, they need a system which provide a vulnerability assessment. Like cogwheel in machine all computers in company have to work as long as possible. They cannot being update all the time. How to set which one vulnerability is the biggest risk? During the time the security lack are not updated the hackers can use them, in that reason time for security specialist is an enemy, but hackers using hackers' community faster than cybersecurity specialist. The crucial updates should be installed firs in that reasons pen testers need system of assessment vulnerabilities and databased with vulnerability, also hackers have a dark net dataset with collections of vulnerability, and often they know vulnerabilities before pen testers. In order to this problem this essay will present the step by step process how to asset vulnerabilities.

VULNERABILITY ASSESSMENT TOOL

In this example of vulnerability assessment would be demonstrated a Nmap. Nmap or the full name is 'Network scanner', it is a free and open source network scanner created by Gordon Lyon (wikipedia, 2019; nd, Introduction, nd). Pen testers use Nmap for task as network inventory, managing services upgrade schedules, and monitoring host or service uptime. Nmap is so popular even it was used in twelve movies one of them was The Matrix Reloaded, the popularity of this tool cause large user support community (nd, Introduction, nd). An example of standard scan is "nmap -sV [target's ip address]" and If pen tester uses Kali Linux, it does not need to install Nmap because Nmap is pre-installed. Nmap is simple for new user to star it out because to run a command in terminal is just needed to write "nmap", settings and target's ip address. Nmap is command line based, otherwise there are also programmes

which add graphic user interface to nmap for example Zen map. One of the Nmap advantages is portability, because most operating system are supported, for example Linux, Microsoft Windows and Mac Os. Nmap can scan thousands of machines, in that reason it can be used to build topology of huge networks.
Nmap has a few useful features:

1. Active port scanning
2. Host discovery
3. OS detection
4. Application version detection
5. Nmap-vulners

The Nmap-vulners script extends the functionality of Nmap by connecting to the CVE database to find information about vulnerabilities on a machine from security experts and this feature makes it the best tool to for vulnerability assessment (SECURITYTRAILS TEAM, 2018).
In this report will be scan machine with ip address 195.168.56.105, results can be seen on figure 5, figure 6, figure 7, figure 8. This machine very vulnerable, what is making it easy target for hackers. This tool require form user to download git repository with data about vulnerability, the repository can be updated and using nmap-vulners needs an intent connection, but all vulnerability are updated.

Figure 5 shows result of standard nmap scanning with –script nmap-vulners of ip address: 192.168.56.101. Port 80 services apache: http_server:2.2.14 and has the most dangerous vulnerability found in this part of scan - CVE-2010-0425, it has 10 point in CVSS version 2.

Figure 6 shows result of standard nmap scanning with –script nmap-vulners of ip address: 192.168.56.102. Port 53 is a domain service and it has the most dangerous vulnerability found in this part of scan - CVE-2012-1667, it has 8.5 point in CVSS version 2. Also, important information is open port 23 telnet which is a backdoor or can be used like backdoor, it gives full control on machines everybody who would connect using this port.

Figure 7 shows result of standard nmap scanning with –script nmap-vulners of ip address: 192.168.56.102. Port 80 services apache: http_server:2.2.8 and has the most dangerous vulnerability found in this part of scan - CVE-2010-0425, it has 10 point in CVSS version 2. This vulnerability is only for windows machines, there is no metasploit in Metasploit framework on Kali Machine dedicated for this CVE on Linux machine.

Figure 8 shows result of standard nmap scanning with –script nmap-vulners of ip address: 192.168.56.102. Port 5432 services PostgreSQL and it has the most dangerous vulnerability found in this part of scan - CVE-2013-1903, it has 10 point in CVSS version 2.

VULNERABILITY VALIDATION

Common vulnerabilities and Exposures (CVE) were stared in 1999 by MITRE (Armerding, 2017). An exposure is a developer's mistake that attacker can use to access to a system or network (Tunggal, 2019). MITRE is a not-for-profit company with mission to make a world

safer, MITRE solves problems with nation's safety or well-being, and it works across the government (MITRE, nd). CVE system's goal is to make easier to share data about vulnerability, in that reason CVE provides common names, CVSS, descriptions, validation and often countermeasures of vulnerabilities for publicly known problems (CVE Team , 2019).

The Common Vulnerability Scoring System is an open framework connect with CVE, the National Vulnerability Database (NVD) provides score for almost all CVE (NVD, nd). The target of CVSS is to show how danger a vulnerability is, it contains tree metric categories: Base, Temporal, and Environmental, where the base score is ranging from 0 to 10 as shown in Figure 1 (10.0 High). The name vulnerability as build form: 'CVE', discovery year and catalogue number, it is easy to figure out an age of vulnerability.

Screenshots below presents examples of CVE vulnerabilities, it can be seen how NVE presents the vulnerability. The inscription has information about date, description and resources with useful links which are there to help administrators to secure their system.

CVE-2010-0425

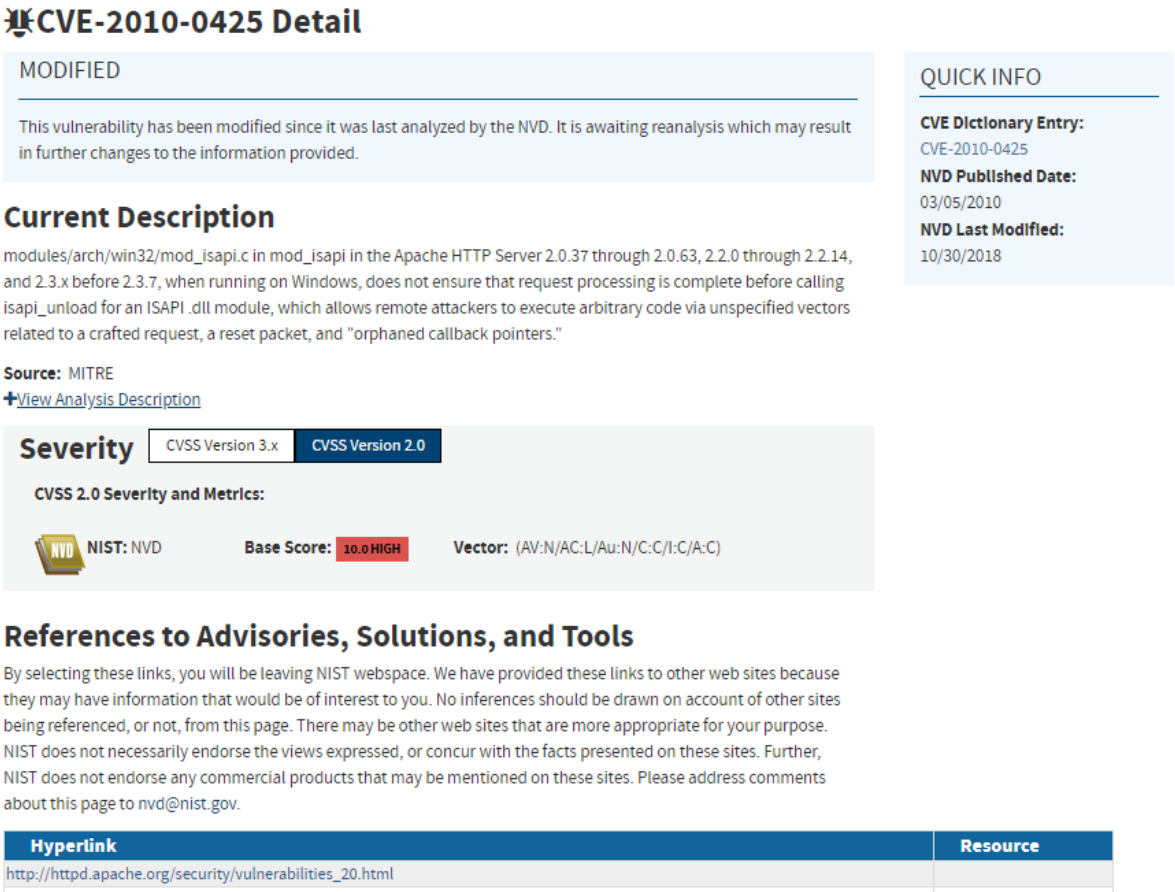


Figure 43

CVE-2010-4478

CVE-2010-4478 Detail

MODIFIED

This vulnerability has been modified since it was last analyzed by the NVD. It is awaiting reanalysis which may result in further changes to the information provided.

QUICK INFO

CVE Dictionary Entry:
CVE-2010-4478
NVD Published Date:
12/06/2010
NVD Last Modified:
09/18/2017

Current Description

OpenSSH 5.6 and earlier, when J-PAKE is enabled, does not properly validate the public parameters in the J-PAKE protocol, which allows remote attackers to bypass the need for knowledge of the shared secret, and successfully authenticate, by sending crafted values in each round of the protocol, a related issue to CVE-2010-4252.

Source: MITRE
+View Analysis Description

Severity

CVSS Version 3.x | CVSS Version 2.0

CVSS 2.0 Severity and Metrics:

NVD **NIST:** NVD **Base Score:** 7.5 HIGH **Vector:** (AV:N/AC:L/Au:N/C:P/I:P/A:P)

References to Advisories, Solutions, and Tools

By selecting these links, you will be leaving NIST webspace. We have provided these links to other web sites because they may have information that would be of interest to you. No inferences should be drawn on account of other sites being referenced, or not, from this page. There may be other web sites that are more appropriate for your purpose. NIST does not necessarily endorse the views expressed, or concur with the facts presented on these sites. Further, NIST does not endorse any commercial products that may be mentioned on these sites. Please address comments about this page to nvd@nist.gov.

Hyperlink	Resource
http://kb.juniper.net/InfoCenter/index?page=content&id=JSA10673	
http://seb.dbzteam.org/crypto/jpake-session-key-retrieval.pdf	Exploit
http://www.openbsd.org/cgi-bin/cvsweb/src/usr.bin/ssh/jpake.c#rev1.5	Patch
http://www.openbsd.org/cgi-bin/cvsweb/src/usr.bin/ssh/jpake.c.diff?r1=1.4;r2=1.5;f=h	Patch
https://bugzilla.redhat.com/show_bug.cgi?id=659297	Patch
https://github.com/seb-m/jpake	
https://oval.cisecurity.org/repository/search/definition/oval%3Aorg.mitre.oval%3Adef%3A12338	

Weakness Enumeration

CWE-ID	CWE Name	Source
CWE-287	Improper Authentication	NIST

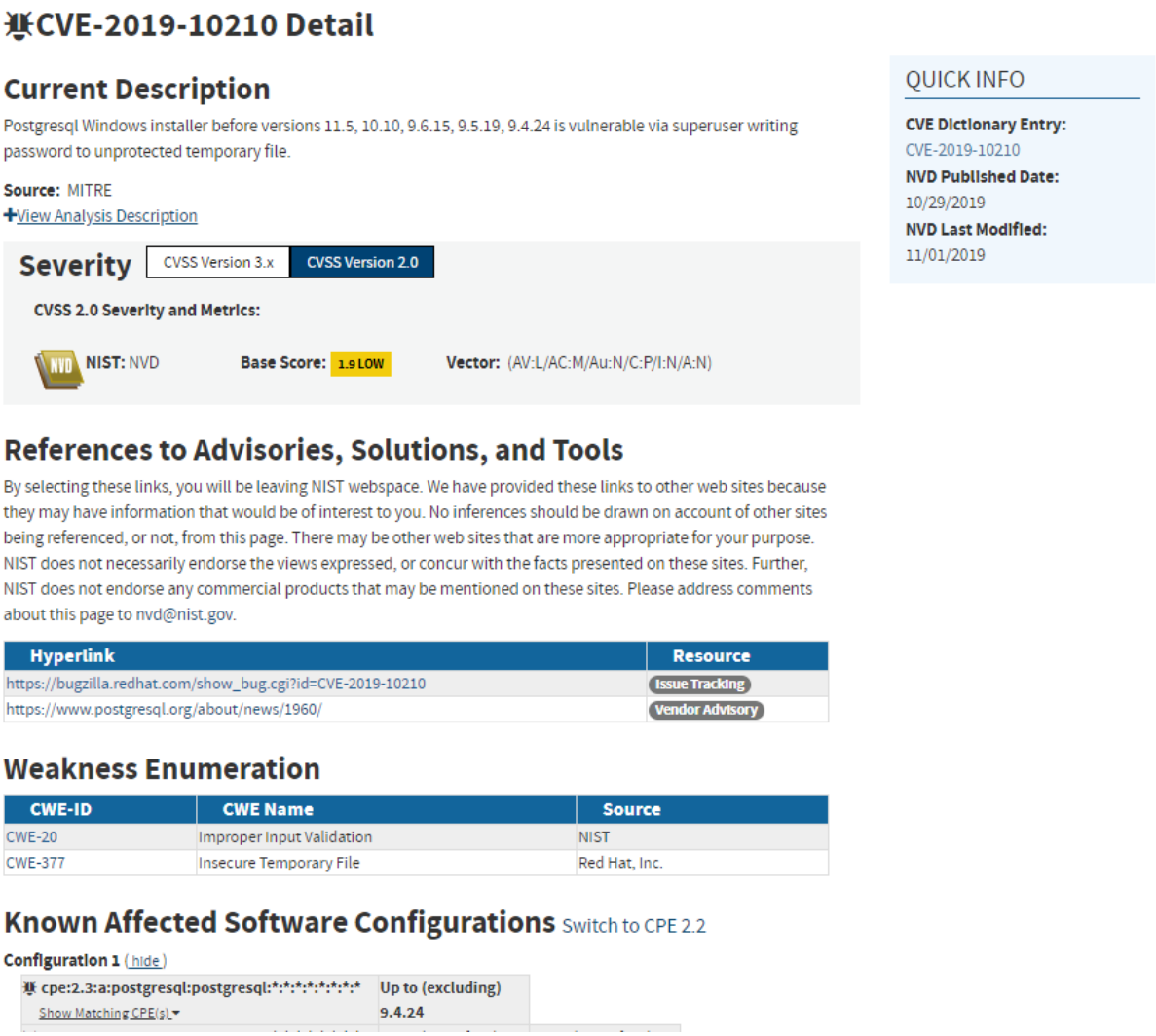
Known Affected Software Configurations Switch to CPE 2.2

Configuration 1 (hide)

Figure 44

CVE-2019-10210

CVSS Version 2.0



CVE-2019-10210 Detail

Current Description

Postgresql Windows installer before versions 11.5, 10.10, 9.6.15, 9.5.19, 9.4.24 is vulnerable via superuser writing password to unprotected temporary file.

Source: MITRE

+View Analysis Description

QUICK INFO

CVE Dictionary Entry:
CVE-2019-10210
NVD Published Date:
10/29/2019
NVD Last Modified:
11/01/2019

Severity

CVSS Version 3.x | CVSS Version 2.0

CVSS 2.0 Severity and Metrics:

NIST: NVD **Base Score:** 1.9 LOW **Vector:** (AV:L/AC:M/Au:N/C:P/I:N/A:N)

References to Advisories, Solutions, and Tools

By selecting these links, you will be leaving NIST webspace. We have provided these links to other web sites because they may have information that would be of interest to you. No inferences should be drawn on account of other sites being referenced, or not, from this page. There may be other web sites that are more appropriate for your purpose. NIST does not necessarily endorse the views expressed, or concur with the facts presented on these sites. Further, NIST does not endorse any commercial products that may be mentioned on these sites. Please address comments about this page to nvd@nist.gov.

Hyperlink	Resource
https://bugzilla.redhat.com/show_bug.cgi?id=CVE-2019-10210	Issue Tracking
https://www.postgresql.org/about/news/1960/	Vendor Advisory

Weakness Enumeration

CWE-ID	CWE Name	Source
CWE-20	Improper Input Validation	NIST
CWE-377	Insecure Temporary File	Red Hat, Inc.

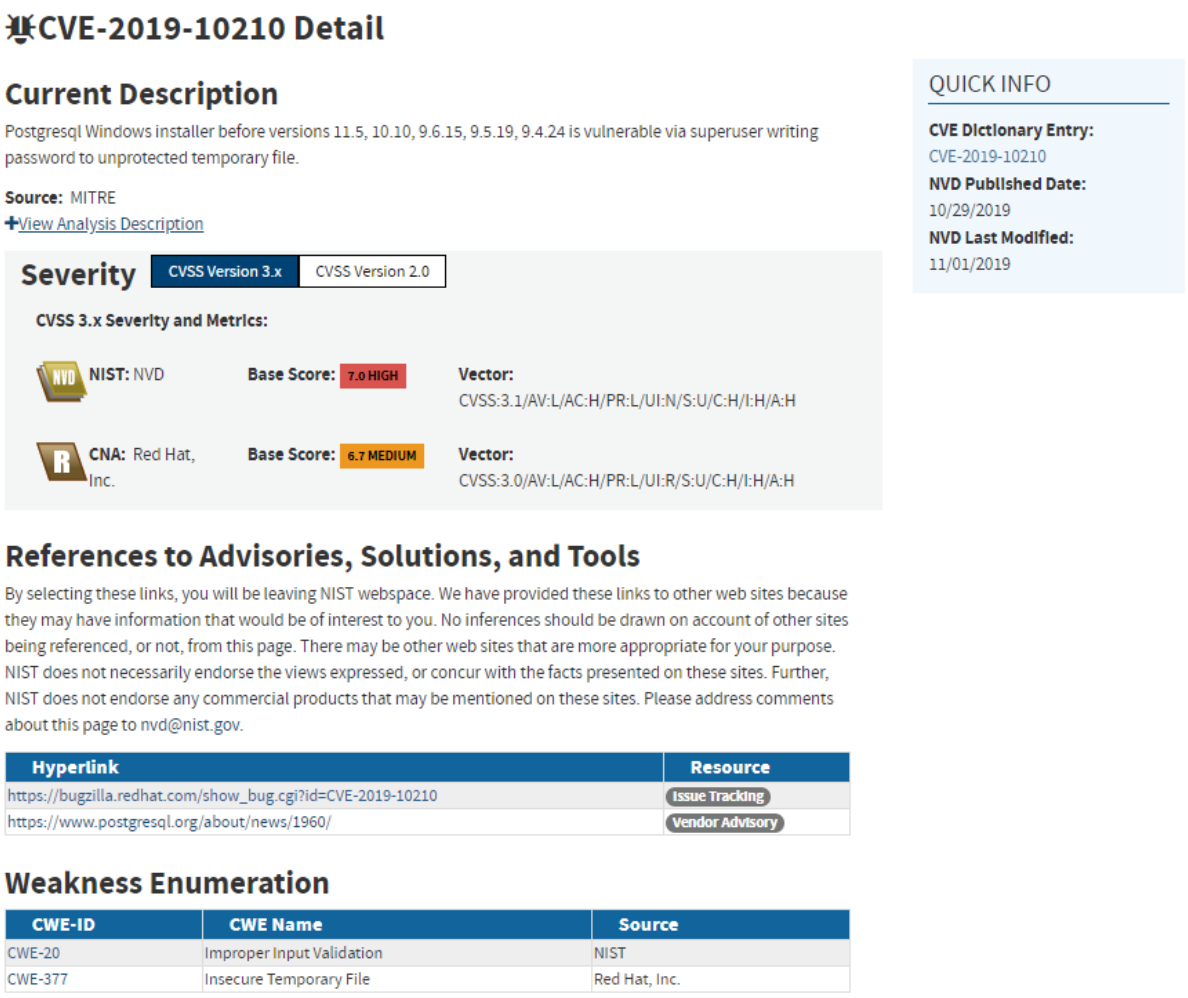
Known Affected Software Configurations Switch to CPE 2.2

Configuration 1 (hide)

cpe:2.3:a:postgresql:postgresql:*:*:*:*:*:*:*:*	Up to (excluding)
Show Matching CPE(s)	9.4.24

Figure 45

CVSS Version 3.x



CVE-2019-10210 Detail

Current Description

Postgresql Windows installer before versions 11.5, 10.10, 9.6.15, 9.5.19, 9.4.24 is vulnerable via superuser writing password to unprotected temporary file.

Source: MITRE

View Analysis Description

QUICK INFO

CVE Dictionary Entry: CVE-2019-10210

NVD Published Date: 10/29/2019

NVD Last Modified: 11/01/2019

Severity

CVSS Version 3.x | CVSS Version 2.0

CVSS 3.x Severity and Metrics:

NIST: NVD — Base Score: 7.0 HIGH — Vector: CVSS:3.1/AV:L/AC:H/PR:L/UI:N/S:U/C:H/I:H/A:H

CNA: Red Hat, Inc. — Base Score: 6.7 MEDIUM — Vector: CVSS:3.0/AV:L/AC:H/PR:L/UI:R/S:U/C:H/I:H/A:H

References to Advisories, Solutions, and Tools

By selecting these links, you will be leaving NIST webspace. We have provided these links to other web sites because they may have information that would be of interest to you. No inferences should be drawn on account of other sites being referenced, or not, from this page. There may be other web sites that are more appropriate for your purpose. NIST does not necessarily endorse the views expressed, or concur with the facts presented on these sites. Further, NIST does not endorse any commercial products that may be mentioned on these sites. Please address comments about this page to nvd@nist.gov.

Hyperlink	Resource
https://bugzilla.redhat.com/show_bug.cgi?id=CVE-2019-10210	Issue Tracking
https://www.postgresql.org/about/news/1960/	Vendor Advisory

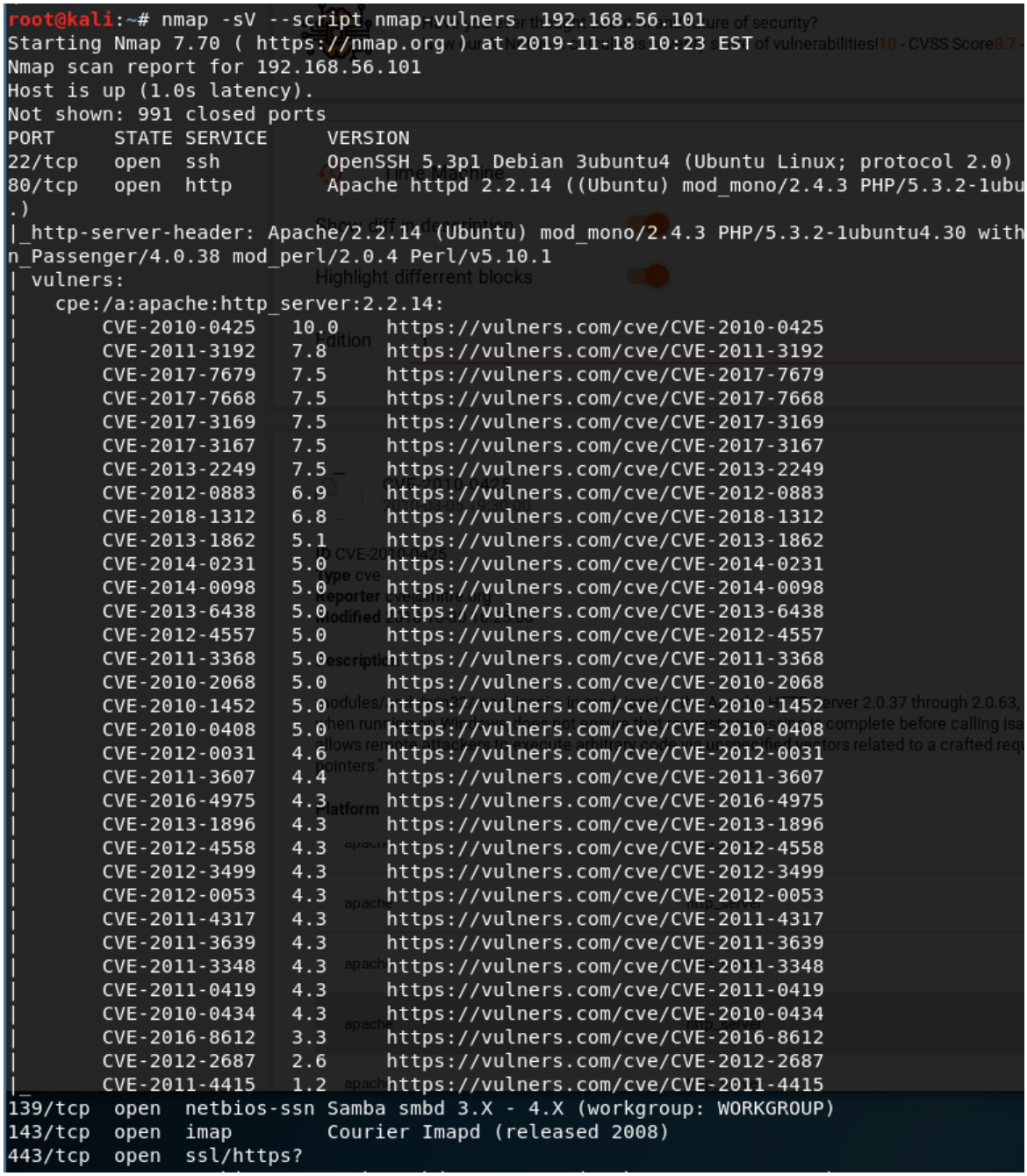
Weakness Enumeration

CWE-ID	CWE Name	Source
CWE-20	Improper Input Validation	NIST
CWE-377	Insecure Temporary File	Red Hat, Inc.

Figure 46

CONCLUSION PORTFOLIO 2

The vulnerability assessment is a crucial part of security management. The web administrator take care about software update and keep all security update download and installed. Paradoxical data bases like CVE and NVD help both attackers and defenders. The hackers or red team learn from that data based what vulnerability to exploit firstly. Also, blue team know on which vulnerability should focus firstly update or reconfigure a system. Only the time matter, how will be first one who will exploit or update vulnerability.



```
root@kali:~# nmap -sV --script nmap-vulners 192.168.56.101
Starting Nmap 7.70 ( https://nmap.org ) at 2019-11-18 10:23 EST
Nmap scan report for 192.168.56.101
Host is up (1.0s latency).
Not shown: 991 closed ports
PORT     STATE SERVICE     VERSION
22/tcp   open  ssh         OpenSSH 5.3p1 Debian 3ubuntu4 (Ubuntu Linux; protocol 2.0)
80/tcp   open  http        Apache httpd 2.2.14 ((Ubuntu) mod_mono/2.4.3 PHP/5.3.2-1ubu
.)
|_http-server-header: Apache/2.2.14 (Ubuntu) mod_mono/2.4.3 PHP/5.3.2-1ubuntu4.30 with
n_Passenger/4.0.38 mod_perl/2.0.4 Perl/v5.10.1
| vulners:
|   cpe:/a:apache:http_server:2.2.14:
|       CVE-2010-0425   10.0    https://vulners.com/cve/CVE-2010-0425
|       CVE-2011-3192   7.8     https://vulners.com/cve/CVE-2011-3192
|       CVE-2017-7679   7.5     https://vulners.com/cve/CVE-2017-7679
|       CVE-2017-7668   7.5     https://vulners.com/cve/CVE-2017-7668
|       CVE-2017-3169   7.5     https://vulners.com/cve/CVE-2017-3169
|       CVE-2017-3167   7.5     https://vulners.com/cve/CVE-2017-3167
|       CVE-2013-2249   7.5     https://vulners.com/cve/CVE-2013-2249
|       CVE-2012-0883   6.9     https://vulners.com/cve/CVE-2012-0883
|       CVE-2018-1312   6.8     https://vulners.com/cve/CVE-2018-1312
|       CVE-2013-1862   5.1     https://vulners.com/cve/CVE-2013-1862
|       CVE-2014-0231   5.0     https://vulners.com/cve/CVE-2014-0231
|       CVE-2014-0098   5.0     https://vulners.com/cve/CVE-2014-0098
|       CVE-2013-6438   5.0     https://vulners.com/cve/CVE-2013-6438
|       CVE-2012-4557   5.0     https://vulners.com/cve/CVE-2012-4557
|       CVE-2011-3368   5.0     https://vulners.com/cve/CVE-2011-3368
|       CVE-2010-2068   5.0     https://vulners.com/cve/CVE-2010-2068
|       CVE-2010-1452   5.0     https://vulners.com/cve/CVE-2010-1452
|       CVE-2010-0408   5.0     https://vulners.com/cve/CVE-2010-0408
|       CVE-2012-0031   4.6     https://vulners.com/cve/CVE-2012-0031
|       CVE-2011-3607   4.4     https://vulners.com/cve/CVE-2011-3607
|       CVE-2016-4975   4.3     https://vulners.com/cve/CVE-2016-4975
|       CVE-2013-1896   4.3     https://vulners.com/cve/CVE-2013-1896
|       CVE-2012-4558   4.3     https://vulners.com/cve/CVE-2012-4558
|       CVE-2012-3499   4.3     https://vulners.com/cve/CVE-2012-3499
|       CVE-2012-0053   4.3     https://vulners.com/cve/CVE-2012-0053
|       CVE-2011-4317   4.3     https://vulners.com/cve/CVE-2011-4317
|       CVE-2011-3639   4.3     https://vulners.com/cve/CVE-2011-3639
|       CVE-2011-3348   4.3     https://vulners.com/cve/CVE-2011-3348
|       CVE-2011-0419   4.3     https://vulners.com/cve/CVE-2011-0419
|       CVE-2010-0434   4.3     https://vulners.com/cve/CVE-2010-0434
|       CVE-2016-8612   3.3     https://vulners.com/cve/CVE-2016-8612
|       CVE-2012-2687   2.6     https://vulners.com/cve/CVE-2012-2687
|_      CVE-2011-4415   1.2     https://vulners.com/cve/CVE-2011-4415
139/tcp  open  netbios-ssn Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
143/tcp  open  imap        Courier Imapd (released 2008)
443/tcp  open  ssl/https?
```

Figure 47

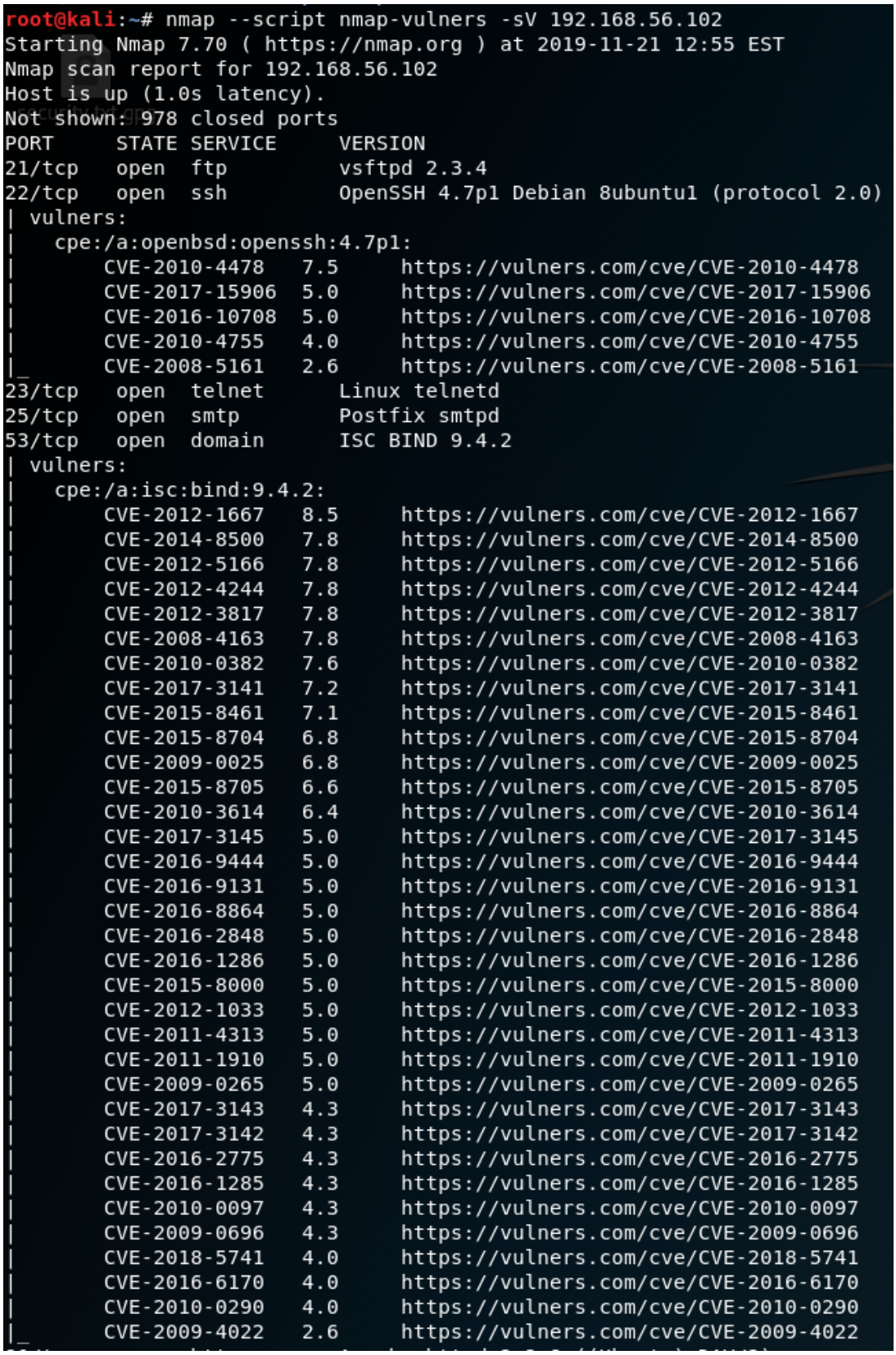

root@kali:~# nmap --script nmap-vulners -sV 192.168.56.102
Starting Nmap 7.70 (https://nmap.org) at 2019-11-21 12:55 EST
Nmap scan report for 192.168.56.102
Host is up (1.0s latency).
Not shown: 978 closed ports
PORT STATE SERVICE VERSION
21/tcp open ftp vsftpd 2.3.4
22/tcp open ssh OpenSSH 4.7p1 Debian 8ubuntu1 (protocol 2.0)
| vulners:
| cpe:/a:openbsd:openssh:4.7p1:
| CVE-2010-4478 7.5 https://vulners.com/cve/CVE-2010-4478
| CVE-2017-15906 5.0 https://vulners.com/cve/CVE-2017-15906
| CVE-2016-10708 5.0 https://vulners.com/cve/CVE-2016-10708
| CVE-2010-4755 4.0 https://vulners.com/cve/CVE-2010-4755
|_ CVE-2008-5161 2.6 https://vulners.com/cve/CVE-2008-5161
23/tcp open telnet Linux telnetd
25/tcp open smtp Postfix smtpd
53/tcp open domain ISC BIND 9.4.2
| vulners:
| cpe:/a:isc:bind:9.4.2:
| CVE-2012-1667 8.5 https://vulners.com/cve/CVE-2012-1667
| CVE-2014-8500 7.8 https://vulners.com/cve/CVE-2014-8500
| CVE-2012-5166 7.8 https://vulners.com/cve/CVE-2012-5166
| CVE-2012-4244 7.8 https://vulners.com/cve/CVE-2012-4244
| CVE-2012-3817 7.8 https://vulners.com/cve/CVE-2012-3817
| CVE-2008-4163 7.8 https://vulners.com/cve/CVE-2008-4163
| CVE-2010-0382 7.6 https://vulners.com/cve/CVE-2010-0382
| CVE-2017-3141 7.2 https://vulners.com/cve/CVE-2017-3141
| CVE-2015-8461 7.1 https://vulners.com/cve/CVE-2015-8461
| CVE-2015-8704 6.8 https://vulners.com/cve/CVE-2015-8704
| CVE-2009-0025 6.8 https://vulners.com/cve/CVE-2009-0025
| CVE-2015-8705 6.6 https://vulners.com/cve/CVE-2015-8705
| CVE-2010-3614 6.4 https://vulners.com/cve/CVE-2010-3614
| CVE-2017-3145 5.0 https://vulners.com/cve/CVE-2017-3145
| CVE-2016-9444 5.0 https://vulners.com/cve/CVE-2016-9444
| CVE-2016-9131 5.0 https://vulners.com/cve/CVE-2016-9131
| CVE-2016-8864 5.0 https://vulners.com/cve/CVE-2016-8864
| CVE-2016-2848 5.0 https://vulners.com/cve/CVE-2016-2848
| CVE-2016-1286 5.0 https://vulners.com/cve/CVE-2016-1286
| CVE-2015-8000 5.0 https://vulners.com/cve/CVE-2015-8000
| CVE-2012-1033 5.0 https://vulners.com/cve/CVE-2012-1033
| CVE-2011-4313 5.0 https://vulners.com/cve/CVE-2011-4313
| CVE-2011-1910 5.0 https://vulners.com/cve/CVE-2011-1910
| CVE-2009-0265 5.0 https://vulners.com/cve/CVE-2009-0265
| CVE-2017-3143 4.3 https://vulners.com/cve/CVE-2017-3143
| CVE-2017-3142 4.3 https://vulners.com/cve/CVE-2017-3142
| CVE-2016-2775 4.3 https://vulners.com/cve/CVE-2016-2775
| CVE-2016-1285 4.3 https://vulners.com/cve/CVE-2016-1285
| CVE-2010-0097 4.3 https://vulners.com/cve/CVE-2010-0097
| CVE-2009-0696 4.3 https://vulners.com/cve/CVE-2009-0696
| CVE-2018-5741 4.0 https://vulners.com/cve/CVE-2018-5741
| CVE-2016-6170 4.0 https://vulners.com/cve/CVE-2016-6170
| CVE-2010-0290 4.0 https://vulners.com/cve/CVE-2010-0290
|_ CVE-2009-4022 2.6 https://vulners.com/cve/CVE-2009-4022

Figure 48

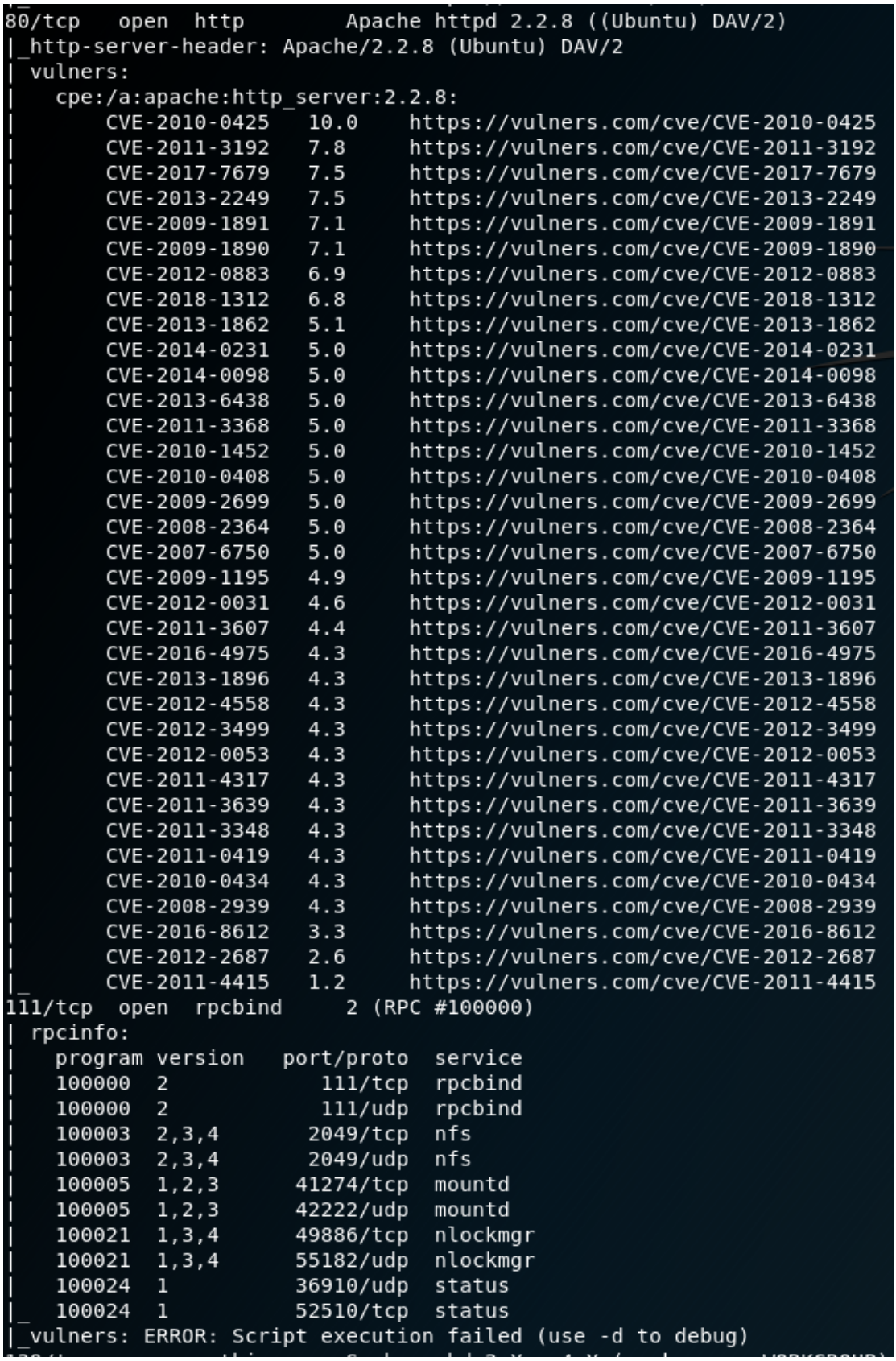

80/tcp open http Apache httpd 2.2.8 ((Ubuntu) DAV/2)
|_http-server-header: Apache/2.2.8 (Ubuntu) DAV/2
| vulners:
| cpe:/a:apache:http_server:2.2.8:
| CVE-2010-0425 10.0 https://vulners.com/cve/CVE-2010-0425
| CVE-2011-3192 7.8 https://vulners.com/cve/CVE-2011-3192
| CVE-2017-7679 7.5 https://vulners.com/cve/CVE-2017-7679
| CVE-2013-2249 7.5 https://vulners.com/cve/CVE-2013-2249
| CVE-2009-1891 7.1 https://vulners.com/cve/CVE-2009-1891
| CVE-2009-1890 7.1 https://vulners.com/cve/CVE-2009-1890
| CVE-2012-0883 6.9 https://vulners.com/cve/CVE-2012-0883
| CVE-2018-1312 6.8 https://vulners.com/cve/CVE-2018-1312
| CVE-2013-1862 5.1 https://vulners.com/cve/CVE-2013-1862
| CVE-2014-0231 5.0 https://vulners.com/cve/CVE-2014-0231
| CVE-2014-0098 5.0 https://vulners.com/cve/CVE-2014-0098
| CVE-2013-6438 5.0 https://vulners.com/cve/CVE-2013-6438
| CVE-2011-3368 5.0 https://vulners.com/cve/CVE-2011-3368
| CVE-2010-1452 5.0 https://vulners.com/cve/CVE-2010-1452
| CVE-2010-0408 5.0 https://vulners.com/cve/CVE-2010-0408
| CVE-2009-2699 5.0 https://vulners.com/cve/CVE-2009-2699
| CVE-2008-2364 5.0 https://vulners.com/cve/CVE-2008-2364
| CVE-2007-6750 5.0 https://vulners.com/cve/CVE-2007-6750
| CVE-2009-1195 4.9 https://vulners.com/cve/CVE-2009-1195
| CVE-2012-0031 4.6 https://vulners.com/cve/CVE-2012-0031
| CVE-2011-3607 4.4 https://vulners.com/cve/CVE-2011-3607
| CVE-2016-4975 4.3 https://vulners.com/cve/CVE-2016-4975
| CVE-2013-1896 4.3 https://vulners.com/cve/CVE-2013-1896
| CVE-2012-4558 4.3 https://vulners.com/cve/CVE-2012-4558
| CVE-2012-3499 4.3 https://vulners.com/cve/CVE-2012-3499
| CVE-2012-0053 4.3 https://vulners.com/cve/CVE-2012-0053
| CVE-2011-4317 4.3 https://vulners.com/cve/CVE-2011-4317
| CVE-2011-3639 4.3 https://vulners.com/cve/CVE-2011-3639
| CVE-2011-3348 4.3 https://vulners.com/cve/CVE-2011-3348
| CVE-2011-0419 4.3 https://vulners.com/cve/CVE-2011-0419
| CVE-2010-0434 4.3 https://vulners.com/cve/CVE-2010-0434
| CVE-2008-2939 4.3 https://vulners.com/cve/CVE-2008-2939
| CVE-2016-8612 3.3 https://vulners.com/cve/CVE-2016-8612
| CVE-2012-2687 2.6 https://vulners.com/cve/CVE-2012-2687
|_ CVE-2011-4415 1.2 https://vulners.com/cve/CVE-2011-4415
111/tcp open rpcbind 2 (RPC #100000)
| rpcinfo:
| program version port/proto service
| 100000 2 111/tcp rpcbind
| 100000 2 111/udp rpcbind
| 100003 2,3,4 2049/tcp nfs
| 100003 2,3,4 2049/udp nfs
| 100005 1,2,3 41274/tcp mountd
| 100005 1,2,3 42222/udp mountd
| 100021 1,3,4 49886/tcp nlockmgr
| 100021 1,3,4 55182/udp nlockmgr
| 100024 1 36910/udp status
|_ 100024 1 52510/tcp status
|_vulners: ERROR: Script execution failed (use -d to debug)

Figure 49

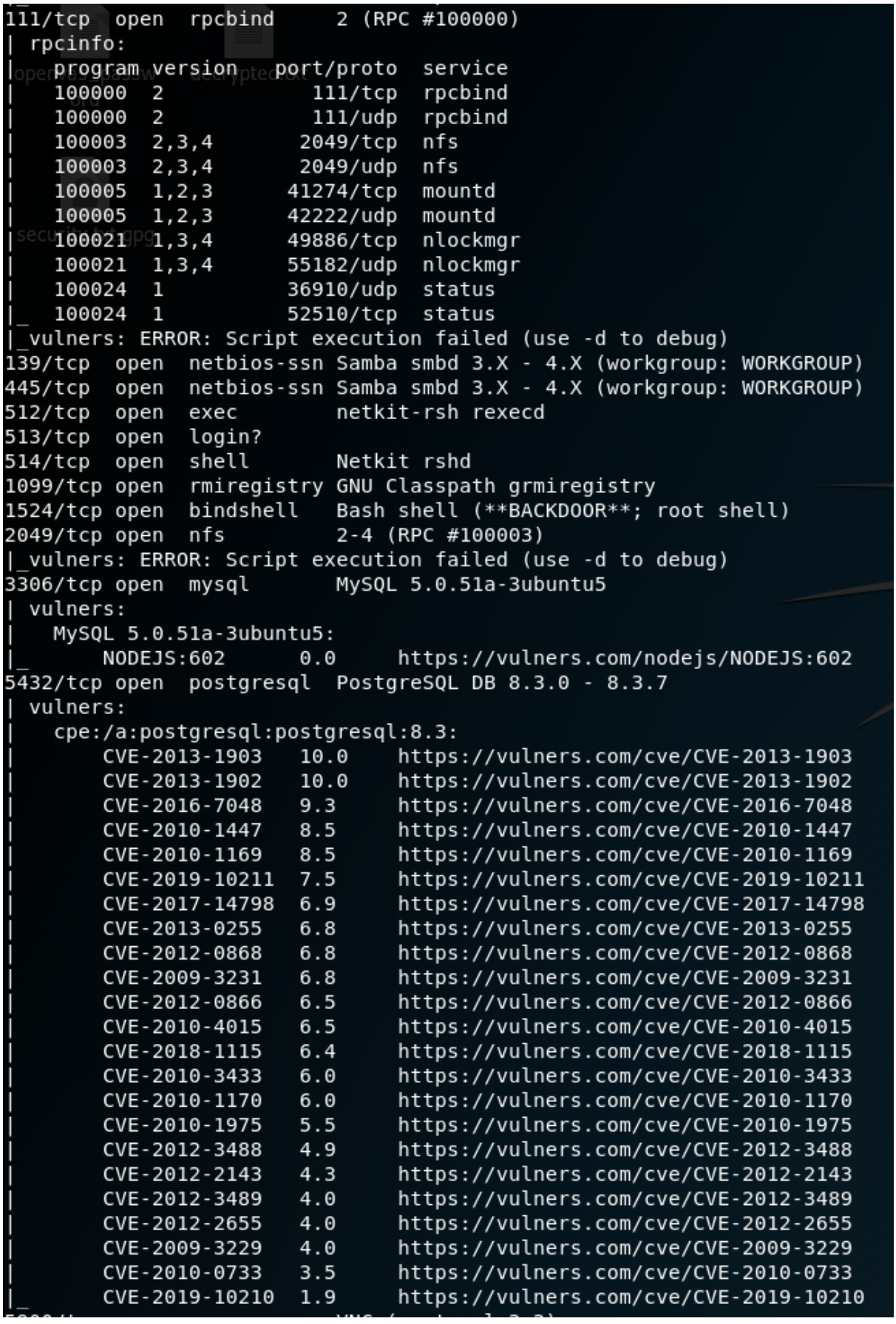

111/tcp open rpcbind 2 (RPC #100000)
| rpcinfo:
| program version port/proto service
| 100000 2 111/tcp rpcbind
| 100000 2 111/udp rpcbind
| 100003 2,3,4 2049/tcp nfs
| 100003 2,3,4 2049/udp nfs
| 100005 1,2,3 41274/tcp mountd
| 100005 1,2,3 42222/udp mountd
| 100021 1,3,4 49886/tcp nlockmgr
| 100021 1,3,4 55182/udp nlockmgr
| 100024 1 36910/udp status
|_ 100024 1 52510/tcp status
|_vulners: ERROR: Script execution failed (use -d to debug)
139/tcp open netbios-ssn Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
445/tcp open netbios-ssn Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
512/tcp open exec netkit-rsh rexecd
513/tcp open login?
514/tcp open shell Netkit rshd
1099/tcp open rmiregistry GNU Classpath grmiregistry
1524/tcp open bindshell Bash shell (**BACKDOOR**; root shell)
2049/tcp open nfs 2-4 (RPC #100003)
|_vulners: ERROR: Script execution failed (use -d to debug)
3306/tcp open mysql MySQL 5.0.51a-3ubuntu5
| vulners:
| MySQL 5.0.51a-3ubuntu5:
|_ NODEJS:602 0.0 https://vulners.com/nodejs/NODEJS:602
5432/tcp open postgresql PostgreSQL DB 8.3.0 - 8.3.7
| vulners:
| cpe:/a:postgresql:postgresql:8.3:
| CVE-2013-1903 10.0 https://vulners.com/cve/CVE-2013-1903
| CVE-2013-1902 10.0 https://vulners.com/cve/CVE-2013-1902
| CVE-2016-7048 9.3 https://vulners.com/cve/CVE-2016-7048
| CVE-2010-1447 8.5 https://vulners.com/cve/CVE-2010-1447
| CVE-2010-1169 8.5 https://vulners.com/cve/CVE-2010-1169
| CVE-2019-10211 7.5 https://vulners.com/cve/CVE-2019-10211
| CVE-2017-14798 6.9 https://vulners.com/cve/CVE-2017-14798
| CVE-2013-0255 6.8 https://vulners.com/cve/CVE-2013-0255
| CVE-2012-0868 6.8 https://vulners.com/cve/CVE-2012-0868
| CVE-2009-3231 6.8 https://vulners.com/cve/CVE-2009-3231
| CVE-2012-0866 6.5 https://vulners.com/cve/CVE-2012-0866
| CVE-2010-4015 6.5 https://vulners.com/cve/CVE-2010-4015
| CVE-2018-1115 6.4 https://vulners.com/cve/CVE-2018-1115
| CVE-2010-3433 6.0 https://vulners.com/cve/CVE-2010-3433
| CVE-2010-1170 6.0 https://vulners.com/cve/CVE-2010-1170
| CVE-2010-1975 5.5 https://vulners.com/cve/CVE-2010-1975
| CVE-2012-3488 4.9 https://vulners.com/cve/CVE-2012-3488
| CVE-2012-2143 4.3 https://vulners.com/cve/CVE-2012-2143
| CVE-2012-3489 4.0 https://vulners.com/cve/CVE-2012-3489
| CVE-2012-2655 4.0 https://vulners.com/cve/CVE-2012-2655
| CVE-2009-3229 4.0 https://vulners.com/cve/CVE-2009-3229
| CVE-2010-0733 3.5 https://vulners.com/cve/CVE-2010-0733
|_ CVE-2019-10210 1.9 https://vulners.com/cve/CVE-2019-10210

Figure 50

Figure 51

CVE-ID

CVE-2013-1903 Learn more at National Vulnerability Database (NVD)
• CVSS Severity Rating • Fix Information • Vulnerable Software Versions • SCAP Mappings • CPE Information

Description

PostgreSQL, possibly 9.2.x before 9.2.4, 9.1.x before 9.1.9, 9.0.x before 9.0.13, 8.4.x before 8.4.17, and 8.3.x before 8.3.23 incorrectly provides the superuser password to scripts related to "graphical installers for Linux and Mac OS X," which has unspecified impact and attack vectors.

References

Note: References are provided for the convenience of the reader to help distinguish between vulnerabilities. The list is not intended to be complete.

- CONFIRM:http://www.oracle.com/technetwork/security-advisory/cpuoct2017-3236626.html
- CONFIRM:http://www.postgresql.org/about/news/1456/
- CONFIRM:http://www.postgresql.org/support/security/

Assigning CNA

Red Hat, Inc.

Date Entry Created

20130219 Disclaimer: The entry creation date may reflect when the CVE ID was allocated or reserved, and does not necessarily indicate when this vulnerability was discovered, shared with the affected vendor, publicly disclosed, or updated in CVE.

Phase (Legacy)

Assigned (20130219)

Votes (Legacy)

Comments (Legacy)

Proposed (Legacy)

N/A

This is an entry on the CVE List, which provides common identifiers for publicly known cybersecurity vulnerabilities.

SEARCH CVE USING KEYWORDS: Submit
You can also search by reference using the CVE Reference Maps.

For More Information: CVE Request Web Form (select "Other" from dropdown)

Figure 52

REFERENCES

Condliffe, J., 2018. *Hackers stole $172 billion from people in 2017.* [Online]
Available at: https://www.technologyreview.com/f/610043/hackers-stole-172-billion-from-people-in-2017/
[Accessed 22 11 2019].

CVE Team , 2019. *Frequently Asked Questions.* [Online]
Available at: https://cve.mitre.org/about/faqs.html#what_is_cve
[Accessed 22 11 2019].

nd, nd. *Introduction.* [Online]
Available at: https://nmap.org/
[Accessed 7 12 2019].

SECURITYTRAILS TEAM, 2018. *Top 5 Best Port Scanners.* [Online]
Available at: https://securitytrails.com/blog/best-port-scanners
[Accessed 07 12 2019].

sophos, nd. *When Malware Goes Mobile.* [Online]
Available at: https://www.sophos.com/en-us/security-news-trends/security-trends/malware-goes-mobile.aspx
[Accessed 7 12 2019].

Tunggal, A. T., 2019. *What is CVE? Common Vulnerabilities and Exposures Explained.* [Online]
Available at: https://www.upguard.com/blog/cve
[Accessed 7 12 2019].

wikipedia, 2019. *Nmap.* [Online]
Available at: https://en.wikipedia.org/wiki/Nmap
[Accessed 07 12 2019].

BIBLIOGRAPHY

http://www.sussex.ac.uk/ei/internal/forstudents/engineeringdesign/studyguides/techreportwriting#1

https://ebookcentral.proquest.com/lib/edgehill/reader.action?docID=952079&query=

https://nostarch.com/metasploit

https://www.csoonline.com/article/3379117/what-is-metasploit-and-how-to-use-this-popular-hacking-tool.html

https://ieeexplore.ieee.org/abstract/document/4275642

https://nmap.org/book/osdetect-usage.html

https://cve.mitre.org/about/faqs.html#what_is_cve

PORTFOLIO 3

This report focusses on applying the penetration testing framework to a virtual real-world environment and how a Penetration test can be carried out successfully. Revealing vulnerabilities can help to ensure that a network can be as secure as possible from many hackers.

The Penetration Testing Framework consists of seven phases:

1. Information Discovery – Various sources will be used by the pentester to gather vital information about a corporation, network or website. Most information found is publicly available, this is known as open-source intelligence, other information could include information regarding the systems which have been provided by enterprises.

   Web crawlers are used for an automated gathering of information on the internet, and this can provide information regarding the targets without the need of querying enterprise employees.

2. Target Scanning – This can require the pentester to send probes out to the network targeted, this can collect preliminary information which can be used to allow the probe to further gain input for extra information. Other forms of target scanning include searching ports, services, operating systems and IP addresses on a network using various tools such as Nmap and OpenVAS.

3. Vulnerability Assessment – The outcome of vulnerability assessments usually come in a form of CVE codes with severity scores to accompany it. These codes allow a pentester to understand what vulnerabilities are on the network and how to possibly exploit them and or fix them. Examples of vulnerabilities that can be identified include remote-code execution, XSS, SQL injection and HeartBleed.

4. Exploiting Weakness – As per the previous phase, once vulnerabilities are discovered, they can be exploited however not all of them can be so easy, there might be a firewall in place, or other aspects that remain outside the scope of the penetration test. Vulnerabilities which are focused on the most are once which can be exploited to gain access to a target system.

5. Privilege Escalation – A pentester, for a penetration test to be completed, needs to be able to exploit the system to gain higher privileges, this can be in form of gaining access as a standard user to gaining administrative rights. This can help a pentester to gain confidential information, deploy malware and to run commands which only admins could run. This can cause serious damage to a network (Banach, 2019).

6. Retaining Access – Retaining access can allow a pentester to keep access to a system or network even after it has been reset, modified or rebooted.

7. Covering Tracks – Within this final phase, a pentester will clear all changes made within the system compromised, whilst doing this, they will return the previously compromised systems to their original configurations before penetration testing took place (Narwal & Gupta, 2015).

Phases 1-4 and 6 (RedLegg, 2019).

This report as mentioned previously shall go into detail with a demonstration of how a penetration test is conducted with examples. These examples follow the case study scenario within the appendix where the pentester is “The HackBay Pvt Ltd” and the network which is being tested is the “The Happy Shop Inc”. The “Happy Shop” networks consist of a Database server, Web server, Windows 7 machine, and a Windows XP machine, the software suite within KaliLinux will be used to carry out the penetration test.

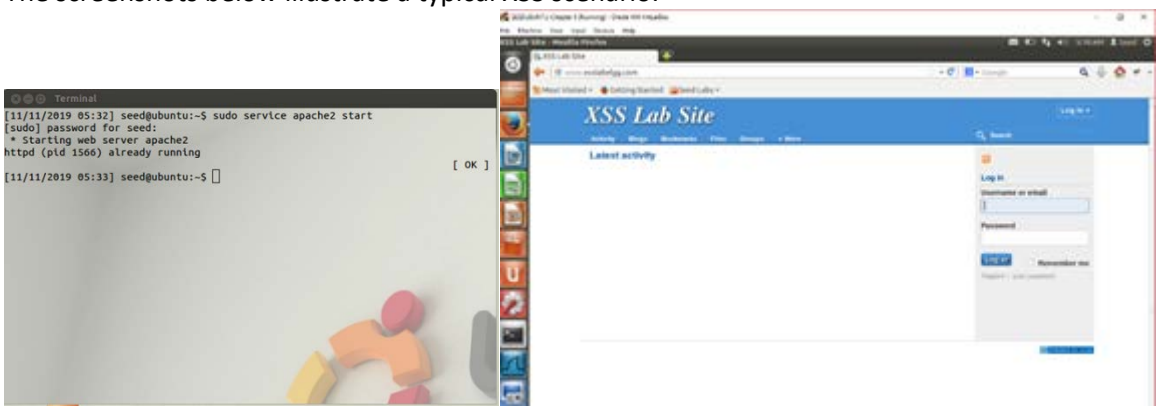
PREPARATION PHASE

XSS

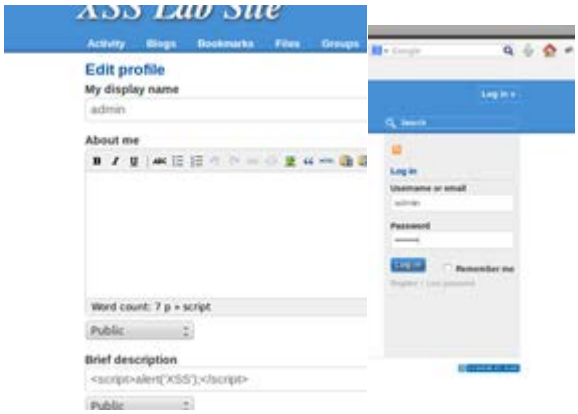
XSS stands for Cross-Site Scripting and is known to be one of the top exploits used in many modern web applications. According to Gupta & Gupta (2017), XSS attacks allow for an attacker to execute malicious scripts on the victim's web browser, this can lead to compromises in data integrity, the loss of cookies, passwords and credit card details amongst other crucial private and confidential information. To further back up the statement that XSS is one of the top exploits, Rodríguez, Torres, Flores & Benavides (2019) analyse the results of the 2018 Cisco Security Report noting that all web applications which have been analysed have at least one attack with XSS making up 40% of all attack attempts.

According to Ruiz (2019), the main vulnerability that can be exploited with XSS would be full control over browsers which is one of the most important pieces of computer software. Typically, as mentioned before, the malicious scripts may contain HTML and JavaScript, they may even manipulate the DOM-node. One last vulnerability that comes from the attack includes the use of downloads including trojans and keyloggers being download on the client-side machine (Ruiz, 2019).

The screenshots below illustrate a typical XSS scenario.

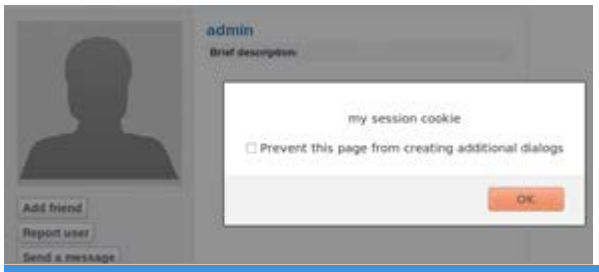


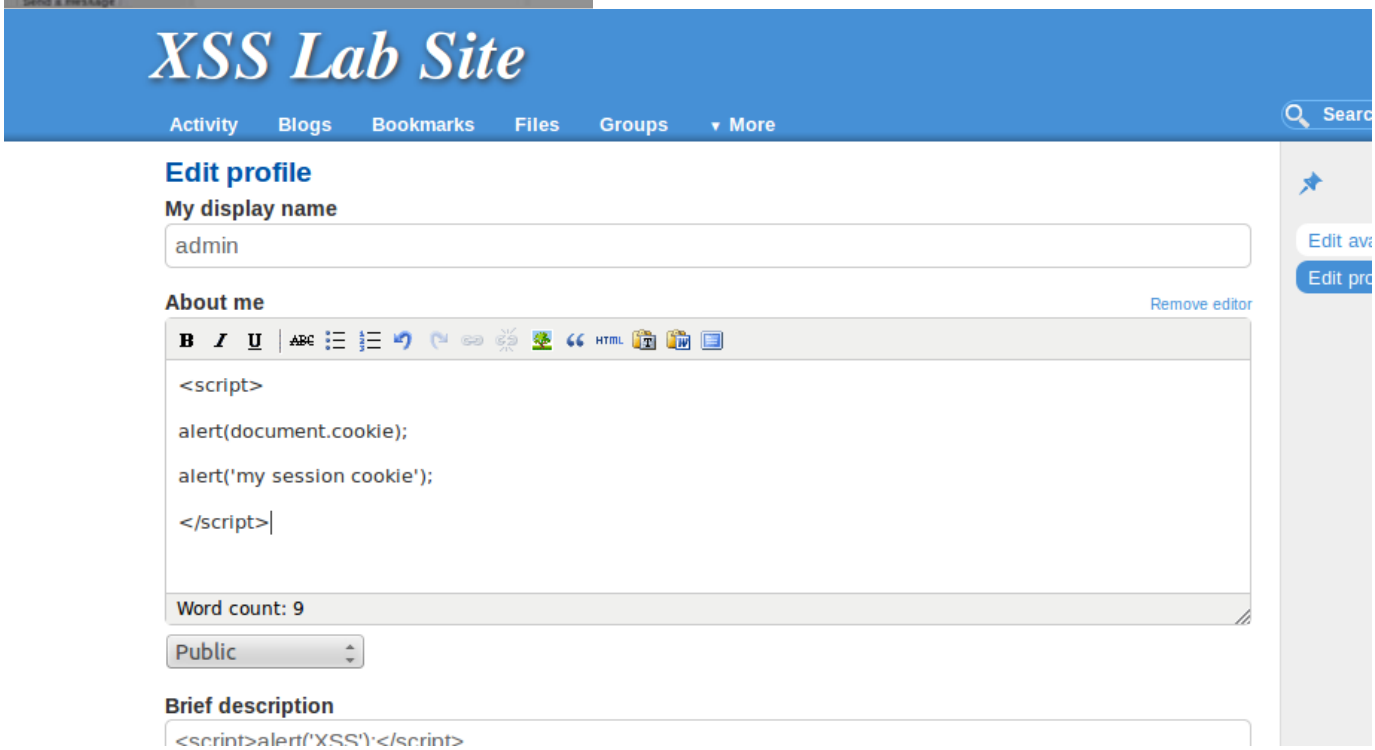
The first screenshot shows the webserver being booted, this webserver hosts www.xsslabelgg.com which is a social media web application. There are multiple user accounts on this network which can be exploited. The example used in this scenario is the account for admin.



With the screenshot above, a malicious script has been entered in the place of the "brief description" for the user, this could also be entered into the "about me" section with the same outcome. What the script aims to do is create a pop-up box for when a user clicks on the admin account. The pop-up box is known as an alert. This is shown in the screenshot below:

The two screenshots below demonstrate a script which displays cookies to a user who may be viewing the admin account.

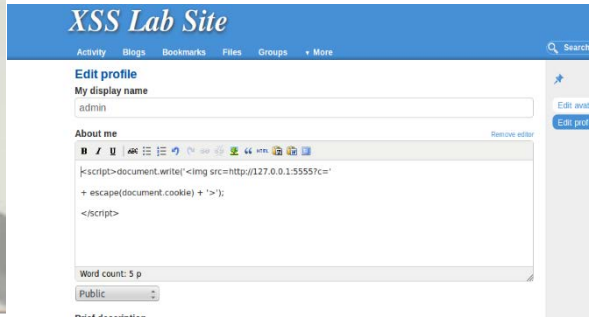


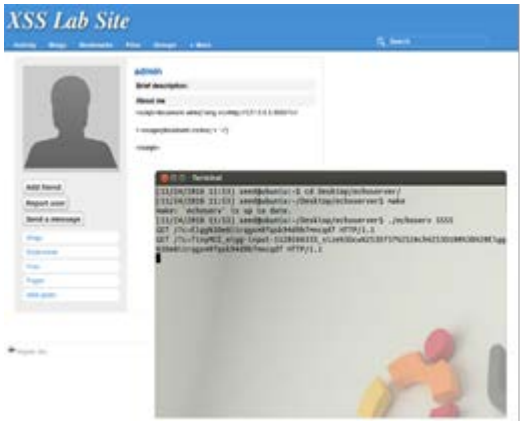


The script demonstrates how cookies are stolen. Previously, users could see their cookies however the attacker could not.

For cookies to become visible to the attacker, an HTTP request to the server is required. The hacker's port number is 5555, this is being listened to by a TCP server. An HTTP GET request is then initiated. An HTTP GET request allows a client to "get" a piece of information from an HTTP server (Singh, 2017).

The TCP server being used is the echoserver which allows for a client and a server to connect, this is shown in the second screenshot. Once configured the cookies are displayed as shown in the third screenshot.





According to Ruiz (2019), a countermeasure which proves quite effective would be the use of a firewall such as “Sucuri”, this firewall is specially designed to mitigate XSS attacks. Methods that work well alongside this countermeasure includes escaping untrusted HTTP requests based on the HTML output, context-sensitive encoding being modified to fight against DOM XSS attacks as well as enabling the Content Security Policy, this method is best used if no other vulnerabilities exist in relation to use of malicious code. Further countermeasures may include integrity checks of digital signatures on serialized objects as well as isolating running code in low privileged environments (Ruiz, 2019).

Huang et al (2017) states that XSS countermeasures fall into three different categories, the first being secure implementation, then defence mechanism deployment and lastly penetration testing. With secure implementation, input validation and sanitization and proper use of a content security policy being enforced. This could stop XSS content from being stored. The XSS penetration test countermeasure involves white-hat testing which can help developers to locate system vulnerabilities (Huang et al, 2017).

SQL Injection

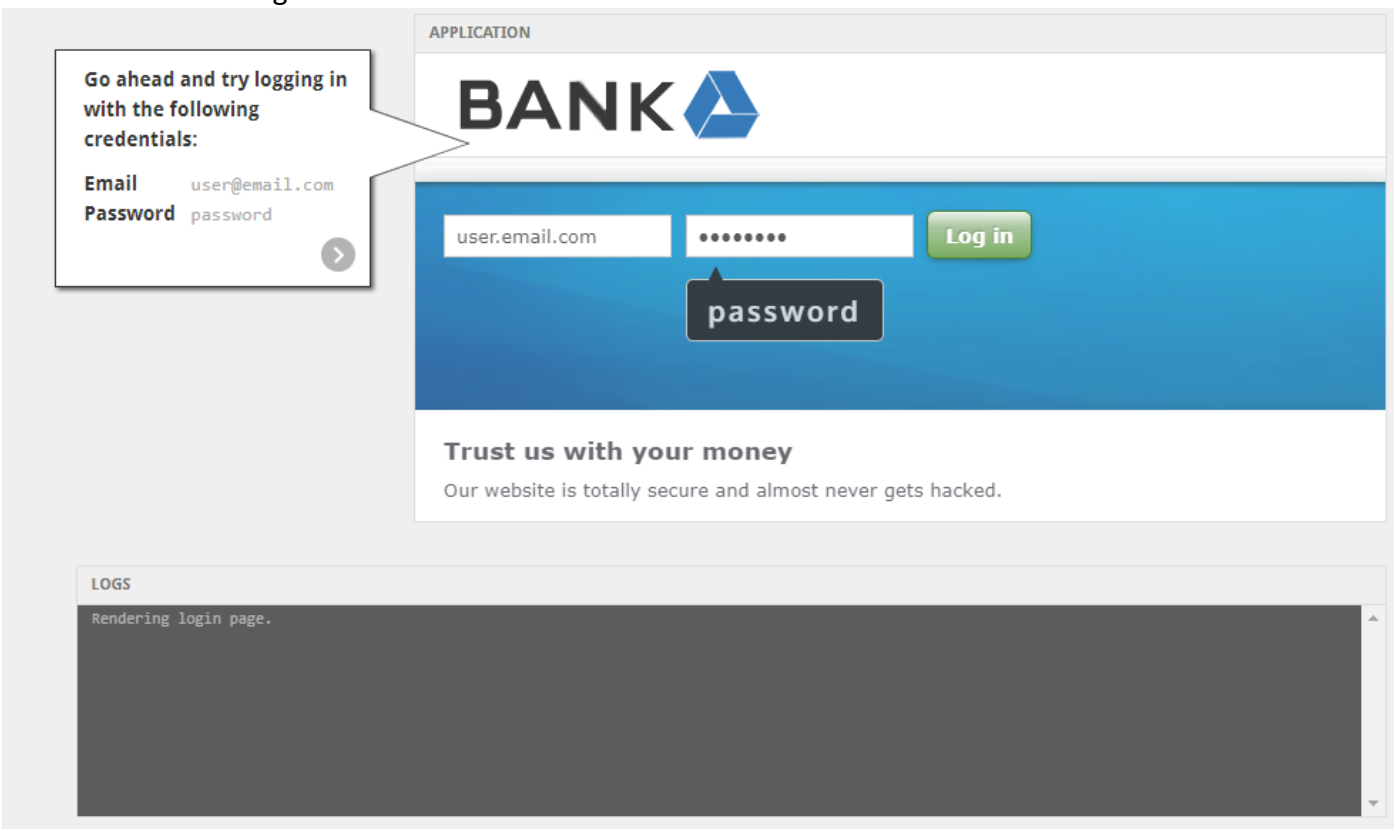
SQL injection involves injection of code where an SQL query is used for malicious purposes. SQL injections allow for attackers to gain unauthorised access to databases and can exploit any weaknesses within them to uncover sensitive information. Sensitive information includes confidential information which can lead to fraud (Halfond et al, 2006).

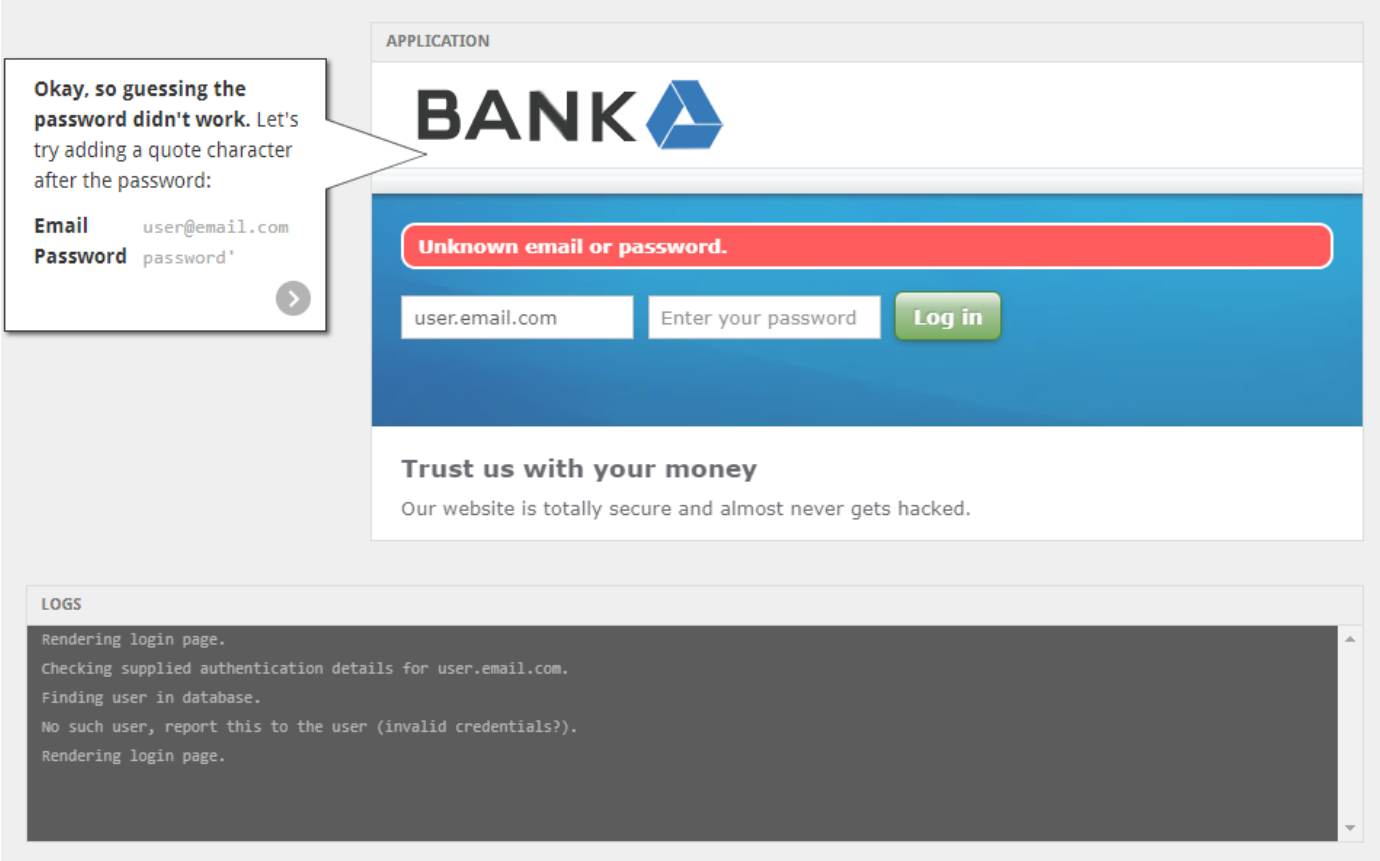
SQL injections are most lethal when a weak input validation technique has been placed on the database, the input validation technique would aim to filter database input so that certain queries cannot be used to cause an injection of malicious code. The most dangerous SQL injection would be when an attacker has the same privileges as an administrator by going through the victim’s back end system. This can lead to disastrous SQL injections. (Atoum & Qaralleh, 2014).

Page Break

Below is an example of SQL injection:

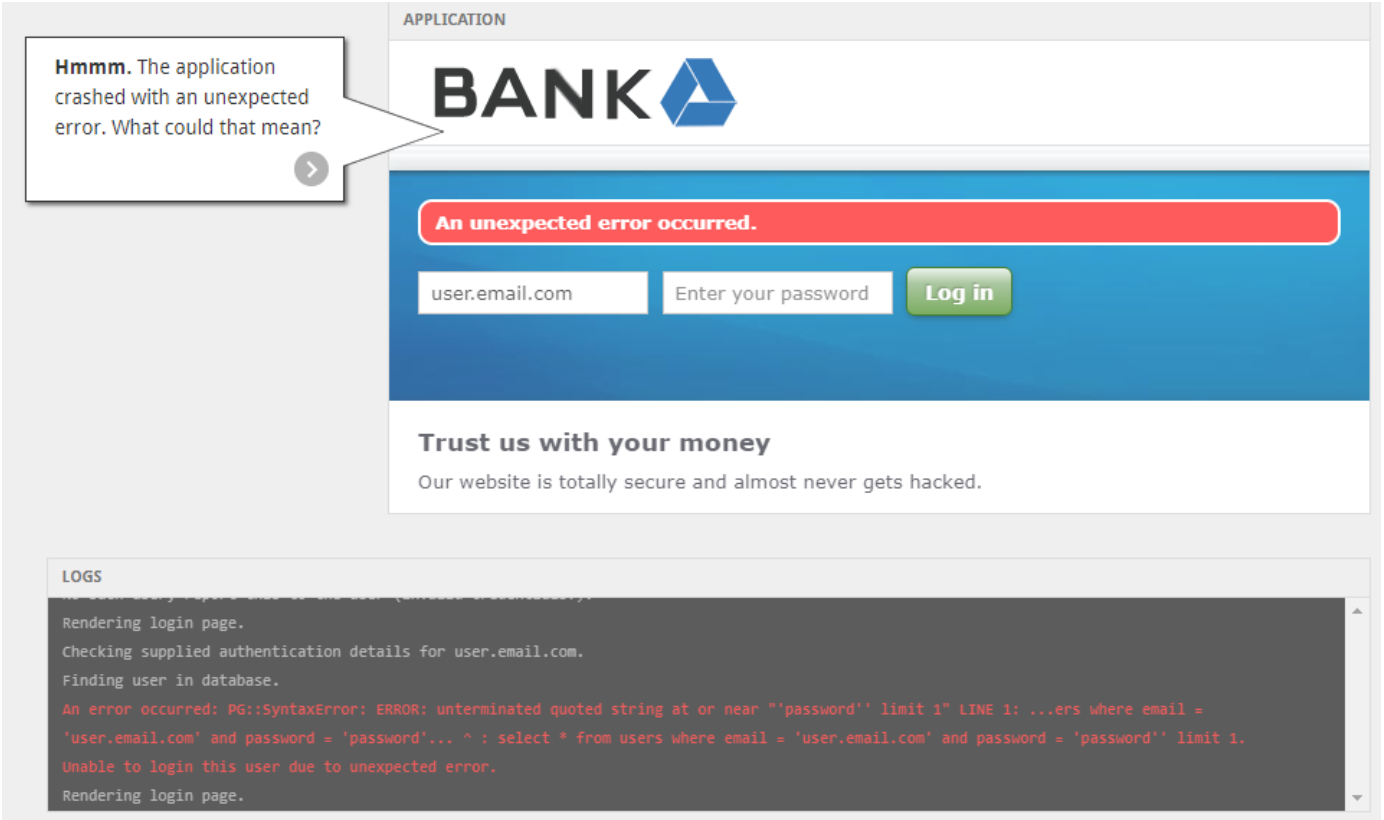
1. Guessing the email and password does not work, the log shows that no user was found with the matching credentials.





2. Same email is used but SQL syntax has been entered into the password box. The password entered this time is “password’”. This determines whether the password box allows special characters. The results below show that special characters are not acceptable.

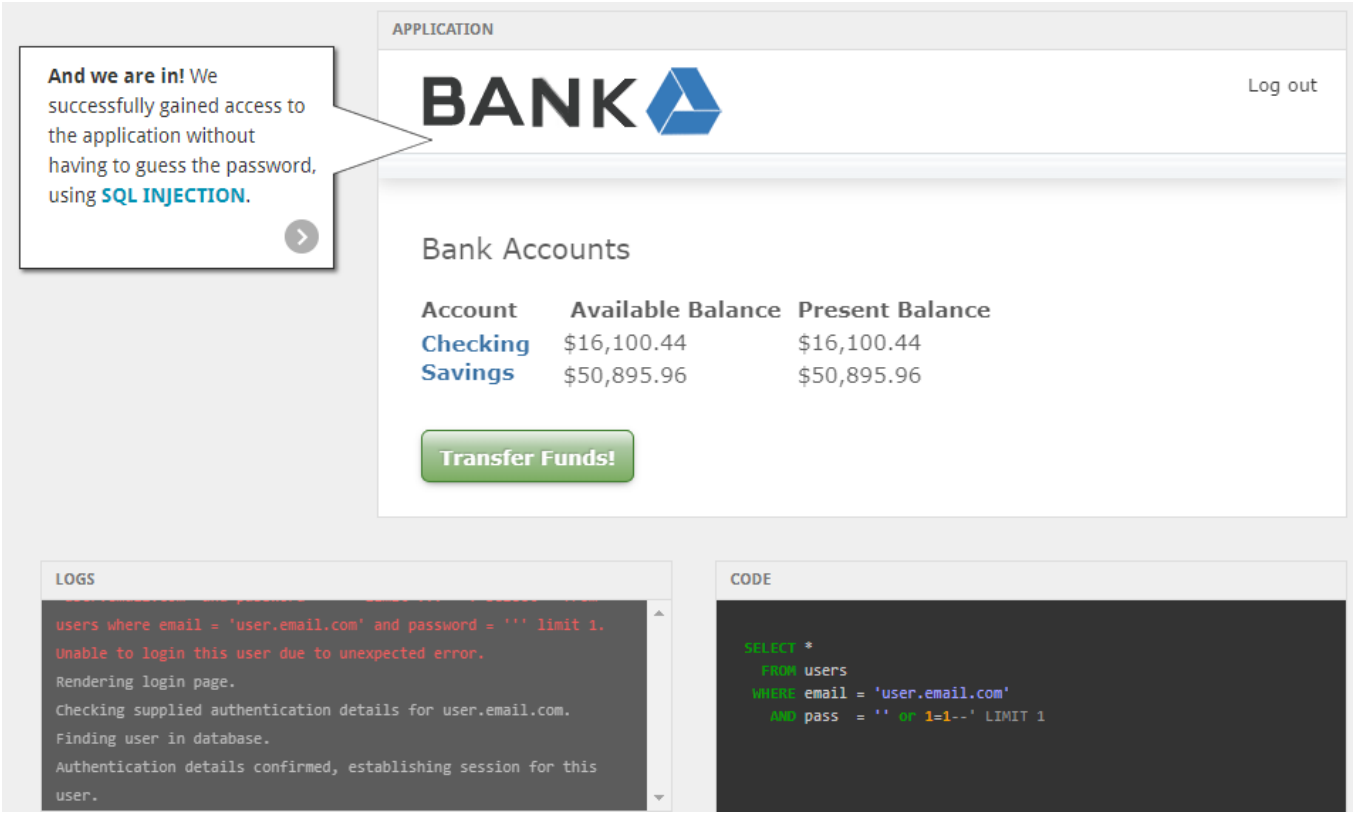
The second screenshot below, showcases that the query had been terminated early, this showcases that the application is vulnerable to SQL injections.



CODE

```
SELECT *
  FROM users
 WHERE email = 'user.email.com'
   AND pass  = 'password'' LIMIT 1
```

Entering in ‘ or 1=1—allowed for unauthorised access to the bank account using SQL injection.



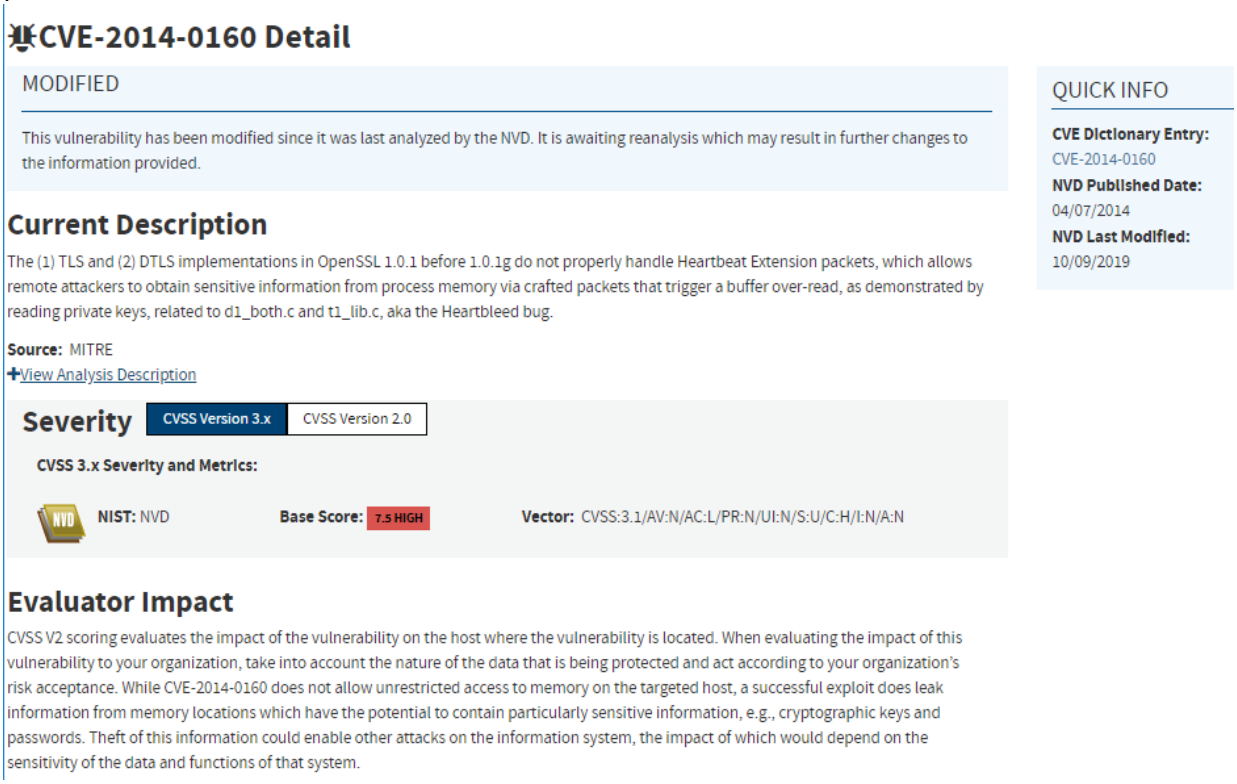
According to Ruiz (2018), preventing SQL injection code depends on the technology used behind the website. An example of this would be the use of WordPress, SQL injection can be avoided by keeping the number of plugins and themes used to a minimum. Ruiz (2018) goes on to discuss the OWASP's technical recommendations which can help to prevent SQL injections, the first being that API's need to be chosen carefully so that any use of the interpreter can be avoided. The next countermeasure which is discussed would be to whitelist server-side input validation which limits input however it is not perfect being that some applications use special characters which could bypass this. Using Limit and other SQL controls within written queries can help to prevent disclosure of records on a database.

HEARTBLEED

Within the OpenSSL cryptographic software library, there is a vulnerability known as the Heartbleed bug. This allows for information which is protected to be stolen, the information could be encrypted by either SSL or TLS. Vulnerable versions of the OpenSSL software can have the memory of their system read by any capable internet user. A compromised component would be secret keys which encrypt network traffic and keeps service providers identities hidden. Other very important vulnerabilities exploited include names and passwords of users who are on the network. What this allows attackers to do is to monitor the various network communications and steal data directly from the services discovered (Heartbleed.com, 2014).

According to Banks (2015), computer servers are quite like a human body in that OpenSSL has a heartbeat. When two servers talk to each other the encryption acts as a heart, each beat communicates connectivity and validation.

The vulnerability code for Heartbleed is **CVE-2014-0160** as can be seen on screen shot below the NVE inform about that attacker can use leak of memory to steal cryptographic keys an passwords.



CVE-2014-0160 Detail

MODIFIED

This vulnerability has been modified since it was last analyzed by the NVD. It is awaiting reanalysis which may result in further changes to the information provided.

Current Description

The (1) TLS and (2) DTLS implementations in OpenSSL 1.0.1 before 1.0.1g do not properly handle Heartbeat Extension packets, which allows remote attackers to obtain sensitive information from process memory via crafted packets that trigger a buffer over-read, as demonstrated by reading private keys, related to d1_both.c and t1_lib.c, aka the Heartbleed bug.

Source: MITRE

View Analysis Description

Severity

CVSS Version 3.x | CVSS Version 2.0

CVSS 3.x Severity and Metrics:

NIST: NVD **Base Score:** 7.5 HIGH **Vector:** CVSS:3.1/AV:N/AC:L/PR:N/UI:N/S:U/C:H/I:N/A:N

Evaluator Impact

CVSS V2 scoring evaluates the impact of the vulnerability on the host where the vulnerability is located. When evaluating the impact of this vulnerability to your organization, take into account the nature of the data that is being protected and act according to your organization's risk acceptance. While CVE-2014-0160 does not allow unrestricted access to memory on the targeted host, a successful exploit does leak information from memory locations which have the potential to contain particularly sensitive information, e.g., cryptographic keys and passwords. Theft of this information could enable other attacks on the information system, the impact of which would depend on the sensitivity of the data and functions of that system.

QUICK INFO

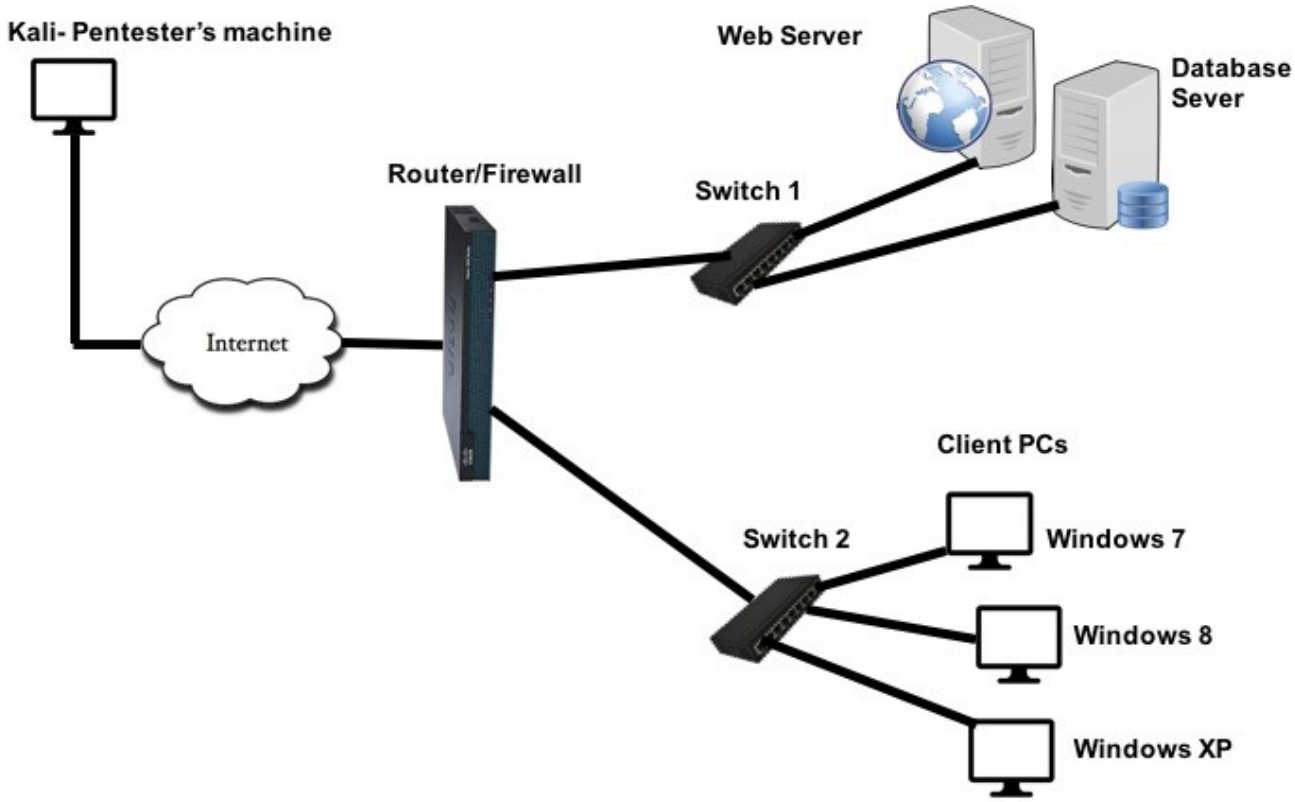
CVE Dictionary Entry: CVE-2014-0160
NVD Published Date: 04/07/2014
NVD Last Modified: 10/09/2019

There is a limitation of Heartbleed which limits attackers to request 64-kilobyte chunks of memory through a single “heartbeat” however there is no limit to how many attacks can be carried out. For example, the attacker may send out multiple heartbeats aka they try to reconnect or maintain an active TLS connection to gain enough memory content until the satisfactory amount of secrets are revealed (Heartbleed.com, 2014).

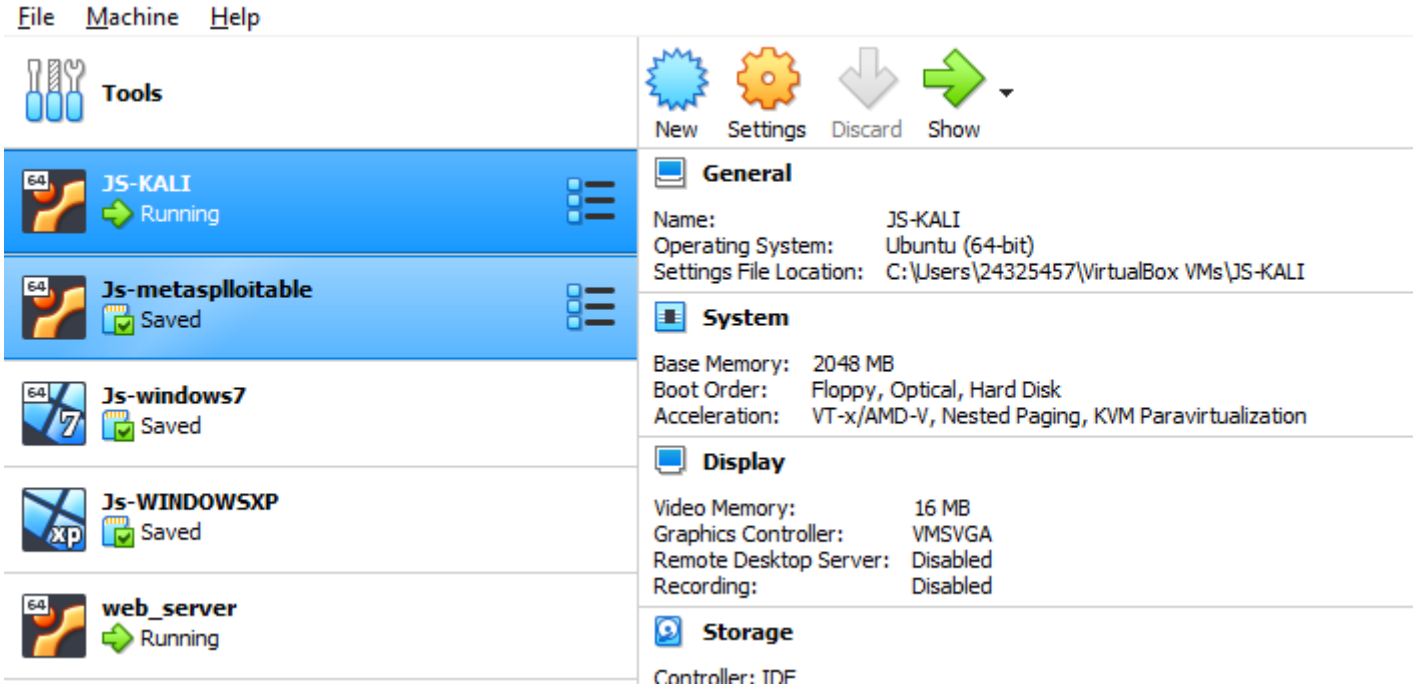
Heartbleed could have been avoided by validating message length and ignoring all Heartbeat requests as they come through, these requests ask for more data than what payloads require (Gajawada, 2016). According to Fruhlinger (2017), the easiest fix for preventing Heartbleed is for servers to have the latest version of OpenSSL which has fixes within the code.

PEN TESTING PHASE AND RECOMMENDATION PHASE

Happy Shop Inc – Network diagram



STEP 1: BUILD THE HAPPY SHOP NETWORK ON VIRTUAL BOX AND GATHER BASIC INFORMATION



Virtual Box Set Up

Portfolio 3 required a computer network to be built, this very network represents HappyShop online. The Virtual Box has features which help users to set up a computer network using only one computer for testing purposes. This virtual network contains two servers “Js-metasplloitable” which is the Database server (metasploitable Linux 2.6.9 – 2.6.33) and “web_server” (Ubuntu) which is the web server. Also, it contains two Windows machine, the first one being Js-windows7 (Windows 7) and Js-WINDOWSXP (Windows XP). To scan a network and finding vulnerabilities another virtual machine was set up, this machine is JS-KALI which uses Kali Linux.

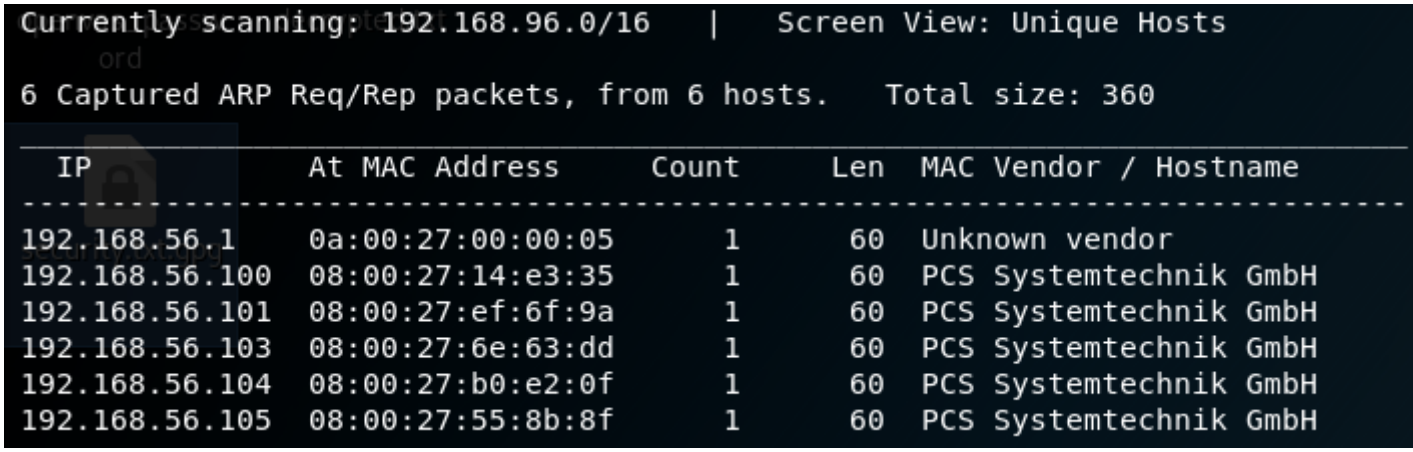
STEP 2: TARGET SCANNING/PROBING

Machine	IP Address	MAC Address	Open Ports
Web Server	192.168.56.101	08:0027:ef:6f:9a	22, 80, 139, 143
Database Server	192.168.56.105	08:00:27:66:8b:8f	21, 22, 23, 25, 53, 80, 111, 139, 3306
Windows 7	192.168.56.103	08:00:27:6e:63:dd	135, 139, 445
Windows XP	192.168.56. 104	08:00:27:bo:e2:0f	135, 139, 445

Netdiscover -i eth0

The “netdiscover” command lists all IP addresses and MAC Addresses that are connected to the network, this is how we got the results shown in the table above, however, this command does not list all the ports found on each machine, the command for that information would be the “nmap -sV” command as shown below.

Figure 1



Nmap -sV (IP Address)

As seen in the screenshots below, the “nmap -sV” command lists all the ports on the selected IP address, it even gives the generalised version of each service used on each port. It is useful for finding all ports on the IP address as well as finding out which ports are open.

Figure 2

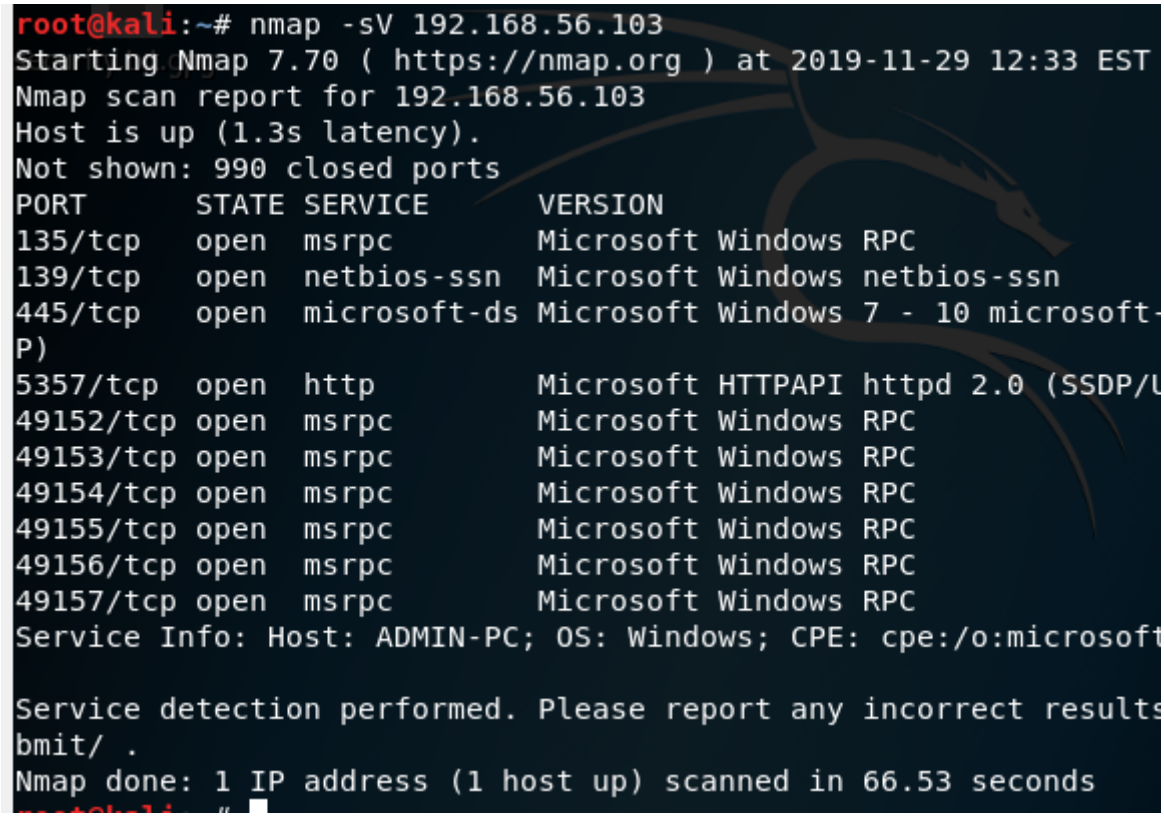


Figure 3

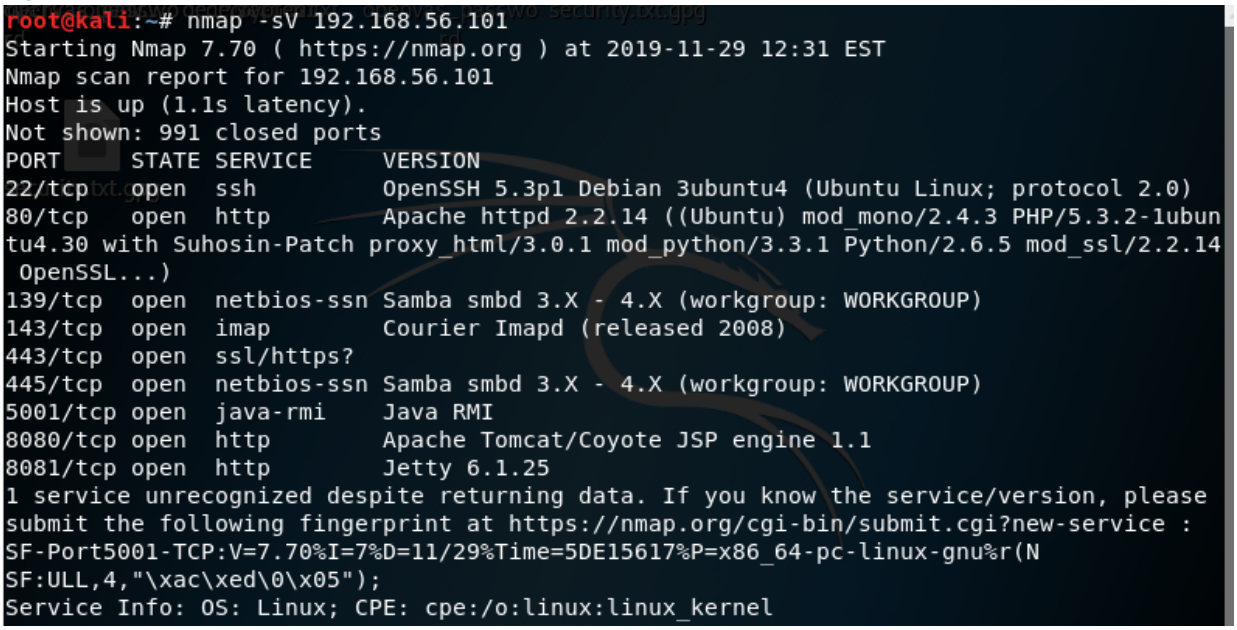


Figure 4

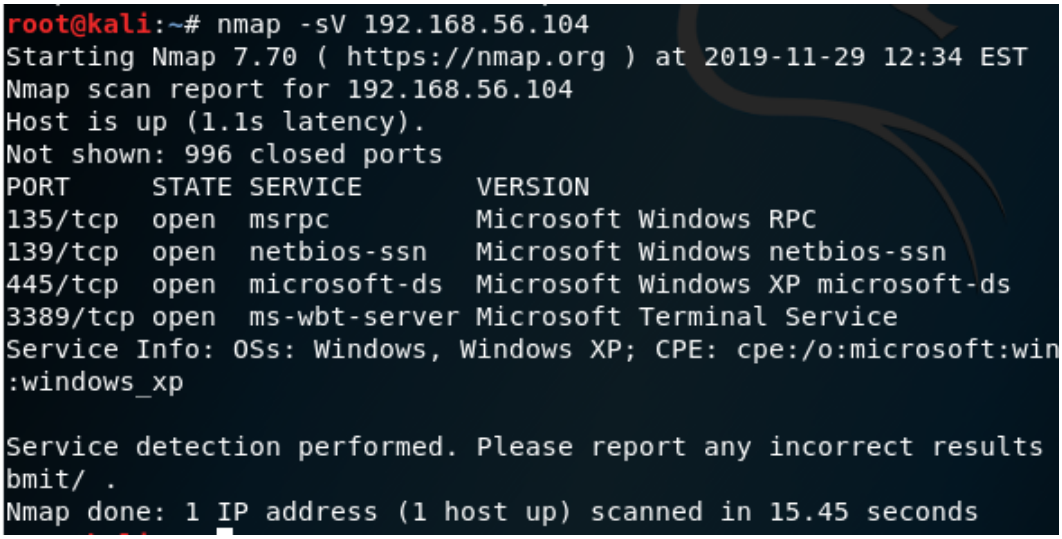
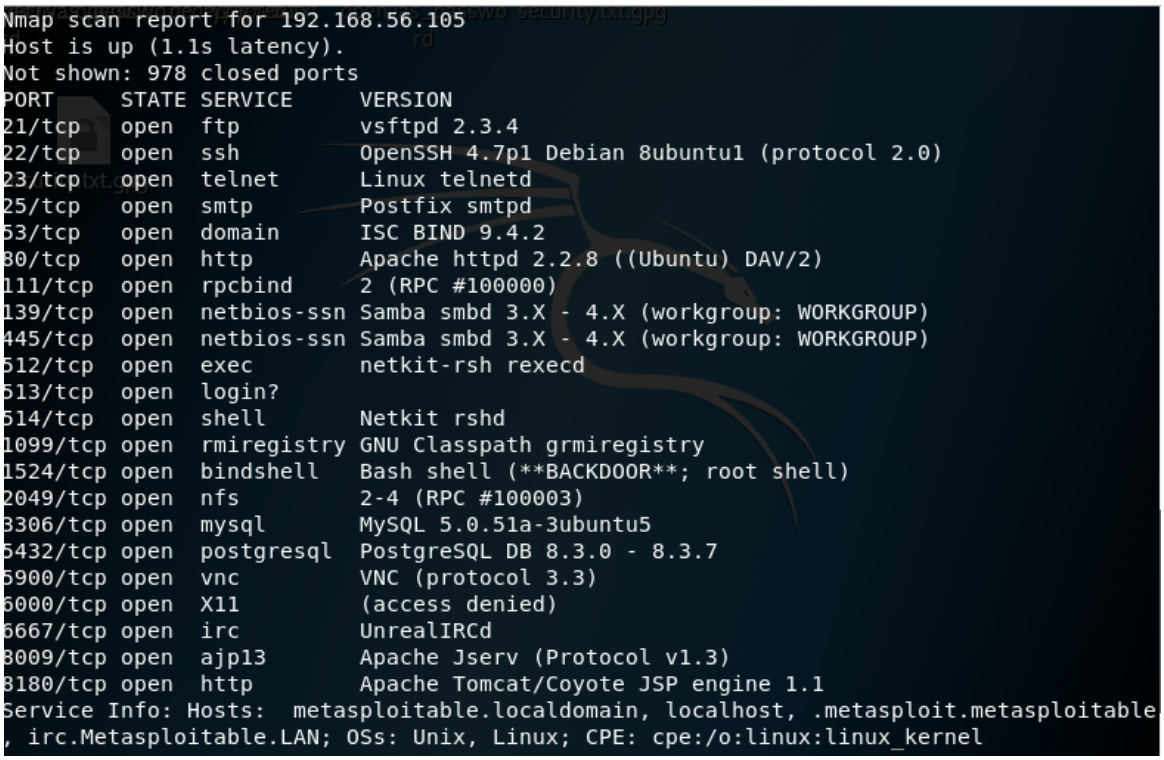


Figure 5



STEP 3: OPERATING SYSTEM DETECTION AND BANNER GRABBING

Machine	Operating System	Names of services	Versions of Service
Web Server	Linux 2.6.17 – 2.6.36	ssh, http, netbios-ssn, imap	OpenSSH 5.3p1 (Ubuntu Linux; protocol 2.0), Apache httpd 2.2.14, Samba smbd 3.X – 4.X, Courier Imapd (2008)
Database Server	Linux 2.6.9 – 2.6.33	ftp, ssh, telnet, smtp, domain, http, rpcbind, netbios-ssn, mysql	vsftpd 2.3.4, OpenSSH 4.7p1, Linux telnetd, Postfix smpd, ISC BIND 9.4.2, Apache httpd 2.2.8, 2, Samba smbd 3.X – 4.X, MySQL 5.0.51a

Nmap -O (IP Address)

This command brings back the version of the operating system which each machine linked to each IP address runs on. For example, when used with the IP address 192.168.56.101, the version brought back by the web server is Linux 2.6.X with a range of 2.6.17 – 2.6.36 which shows that the command is not the most accurate. The use of this command is useful for checking if an operating system is out of date which could lead to further vulnerabilities.

Figure 6

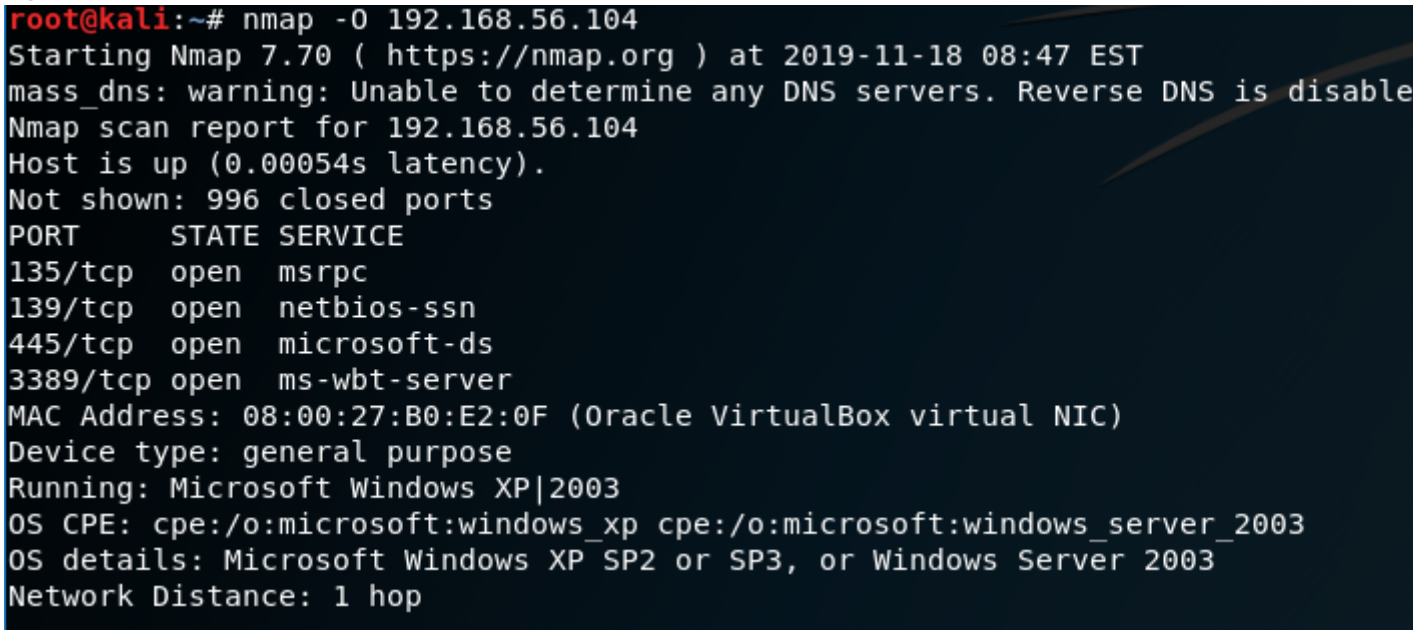
```
root@kali:~# nmap -O 192.168.56.101
Starting Nmap 7.70 ( https://nmap.org ) at 2019-11-18 08:46 EST
mass_dns: warning: Unable to determine any DNS servers. Reverse DNS
Nmap scan report for 192.168.56.101
Host is up (0.00035s latency).
Not shown: 991 closed ports
PORT     STATE SERVICE
22/tcp   open  ssh
80/tcp   open  http
139/tcp  open  netbios-ssn
143/tcp  open  imap
443/tcp  open  https
445/tcp  open  microsoft-ds
5001/tcp open  commplex-link
8080/tcp open  http-proxy
8081/tcp open  blackice-icecap
MAC Address: 08:00:27:EF:6F:9A (Oracle VirtualBox virtual NIC)
Device type: general purpose
Running: Linux 2.6.X
OS CPE: cpe:/o:linux:linux_kernel:2.6
OS details: Linux 2.6.17 - 2.6.36
Network Distance: 1 hop
```

Figure 7

```
root@kali:~# nmap -O 192.168.56.103
Starting Nmap 7.70 ( https://nmap.org ) at 2019-11-29 12:52 EST
Nmap scan report for 192.168.56.103
Host is up (0.067s latency).
Not shown: 990 closed ports
PORT      STATE SERVICE
135/tcp   open  msrpc
139/tcp   open  netbios-ssn
445/tcp   open  microsoft-ds
5357/tcp  open  wsdapi
49152/tcp open  unknown
49153/tcp open  unknown
49154/tcp open  unknown
49155/tcp open  unknown
49156/tcp open  unknown
49157/tcp open  unknown
Device type: bridge|general purpose|switch
Running (JUST GUESSING): Oracle Virtualbox (96%), QEMU (94%), Cisco embedded (
OS CPE: cpe:/o:oracle:virtualbox cpe:/a:qemu:qemu cpe:/h:cisco:css_11501
Aggressive OS guesses: Oracle Virtualbox (96%), QEMU user mode network gateway
isco CSS 11501 switch (86%)
No exact OS matches for host (test conditions non-ideal).

OS detection performed. Please report any incorrect results at https://nmap.or
 .
Nmap done: 1 IP address (1 host up) scanned in 19.71 seconds
```

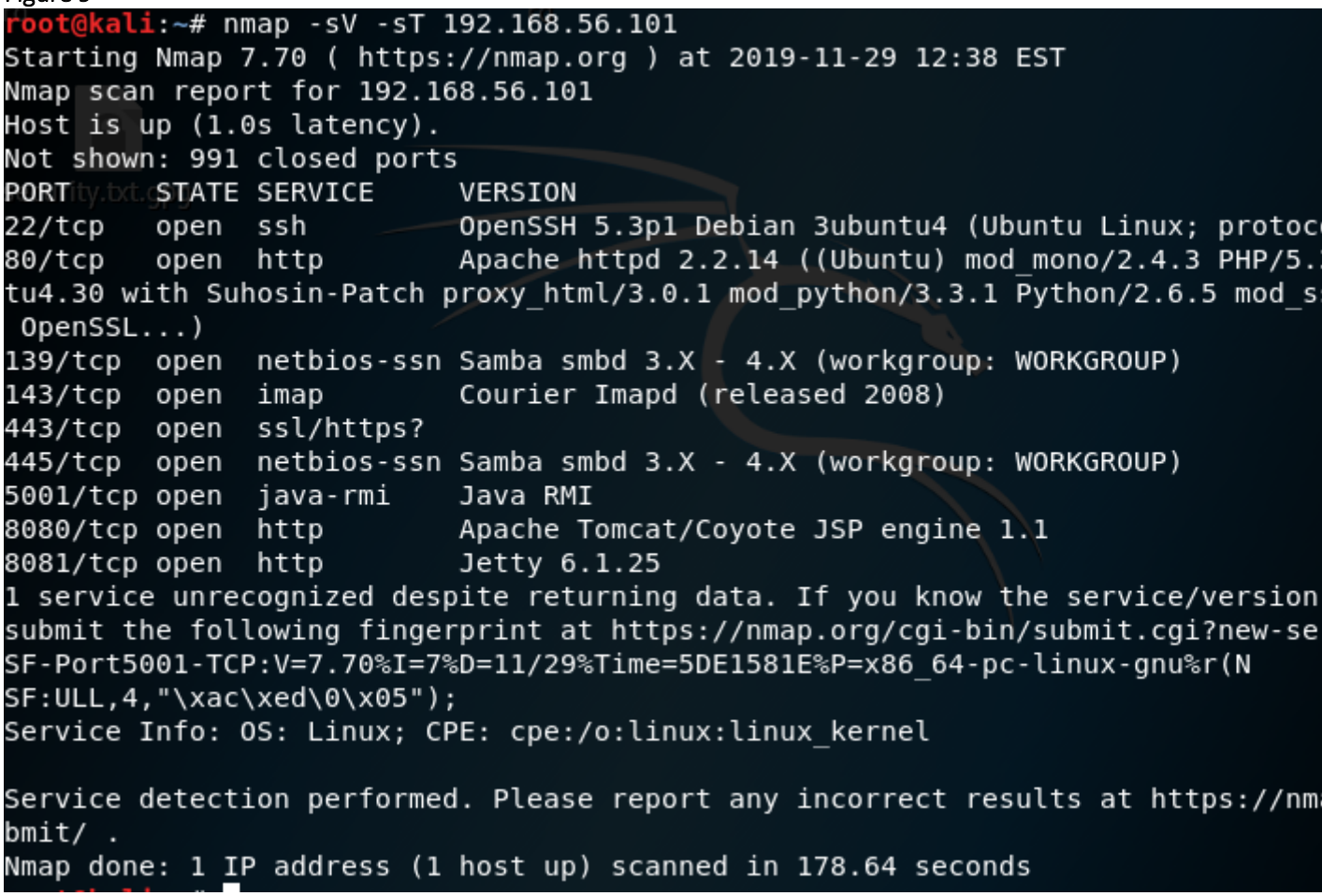
Figure 8



Nmap -sV -sT (IP Address)

Using this command brought back the services and service versions. Using this command allows for a clear understanding of whether there are any outdated versions of services, with this, there might be possible vulnerabilities that could be exploited that newer versions have fixed. The “-sT” portion of the command specifies for ports with TCP to be scanned for services.

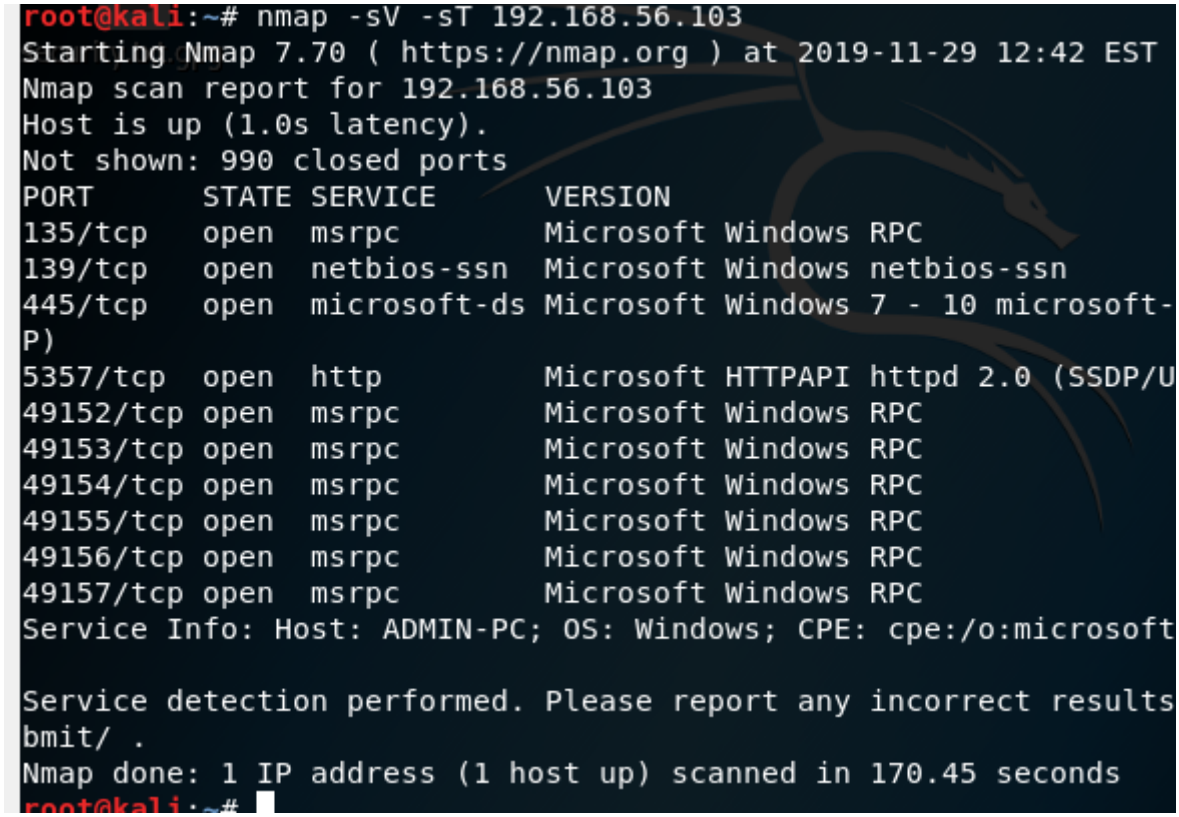
Figure 9



```
root@kali:~# nmap -sV -sT 192.168.56.101
Starting Nmap 7.70 ( https://nmap.org ) at 2019-11-29 12:38 EST
Nmap scan report for 192.168.56.101
Host is up (1.0s latency).
Not shown: 991 closed ports
PORT     STATE SERVICE     VERSION
22/tcp   open  ssh         OpenSSH 5.3p1 Debian 3ubuntu4 (Ubuntu Linux; protoc
80/tcp   open  http        Apache httpd 2.2.14 ((Ubuntu) mod_mono/2.4.3 PHP/5.
tu4.30 with Suhosin-Patch proxy_html/3.0.1 mod_python/3.3.1 Python/2.6.5 mod_s
 OpenSSL...)
139/tcp  open  netbios-ssn Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
143/tcp  open  imap        Courier Imapd (released 2008)
443/tcp  open  ssl/https?
445/tcp  open  netbios-ssn Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
5001/tcp open  java-rmi    Java RMI
8080/tcp open  http        Apache Tomcat/Coyote JSP engine 1.1
8081/tcp open  http        Jetty 6.1.25
1 service unrecognized despite returning data. If you know the service/version
submit the following fingerprint at https://nmap.org/cgi-bin/submit.cgi?new-se
SF-Port5001-TCP:V=7.70%I=7%D=11/29%Time=5DE1581E%P=x86_64-pc-linux-gnu%r(N
SF:ULL,4,"\xac\xed\0\x05");
Service Info: OS: Linux; CPE: cpe:/o:linux:linux_kernel

Service detection performed. Please report any incorrect results at https://nm
bmit/ .
Nmap done: 1 IP address (1 host up) scanned in 178.64 seconds
```

Figure 10



```
root@kali:~# nmap -sV -sT 192.168.56.103
Starting Nmap 7.70 ( https://nmap.org ) at 2019-11-29 12:42 EST
Nmap scan report for 192.168.56.103
Host is up (1.0s latency).
Not shown: 990 closed ports
PORT      STATE SERVICE      VERSION
135/tcp   open  msrpc        Microsoft Windows RPC
139/tcp   open  netbios-ssn  Microsoft Windows netbios-ssn
445/tcp   open  microsoft-ds Microsoft Windows 7 - 10 microsoft-
P)
5357/tcp  open  http         Microsoft HTTPAPI httpd 2.0 (SSDP/U
49152/tcp open  msrpc        Microsoft Windows RPC
49153/tcp open  msrpc        Microsoft Windows RPC
49154/tcp open  msrpc        Microsoft Windows RPC
49155/tcp open  msrpc        Microsoft Windows RPC
49156/tcp open  msrpc        Microsoft Windows RPC
49157/tcp open  msrpc        Microsoft Windows RPC
Service Info: Host: ADMIN-PC; OS: Windows; CPE: cpe:/o:microsoft

Service detection performed. Please report any incorrect results
bmit/ .
Nmap done: 1 IP address (1 host up) scanned in 170.45 seconds
root@kali:~#
```

Figure 11

```
root@kali:~# nmap -sV -sT 192.168.56.104
Starting Nmap 7.70 ( https://nmap.org ) at 2019-11-29 12:46 EST
Nmap scan report for 192.168.56.104
Host is up (1.0s latency).
Not shown: 996 closed ports
PORT     STATE SERVICE       VERSION
135/tcp  open  msrpc         Microsoft Windows RPC
139/tcp  open  netbios-ssn   Microsoft Windows netbios-ssn
445/tcp  open  microsoft-ds  Microsoft Windows XP microsoft-ds
3389/tcp open  ms-wbt-server Microsoft Terminal Service
Service Info: OSs: Windows, Windows XP; CPE: cpe:/o:microsoft:windows, cpe:/o:
:windows_xp

Service detection performed. Please report any incorrect results at https://nm
bmit/ .
Nmap done: 1 IP address (1 host up) scanned in 200.76 seconds
```

Figure 12

```
Nmap scan report for 192.168.56.105
Host is up (1.0s latency).
Not shown: 978 closed ports
PORT     STATE SERVICE     VERSION
21/tcp   open  ftp         vsftpd 2.3.4
22/tcp   open  ssh         OpenSSH 4.7p1 Debian 8ubuntu1 (protocol 2.0)
23/tcp   open  telnet      Linux telnetd
25/tcp   open  smtp        Postfix smtpd
53/tcp   open  domain      ISC BIND 9.4.2
80/tcp   open  http        Apache httpd 2.2.8 ((Ubuntu) DAV/2)
111/tcp  open  rpcbind     2 (RPC #100000)
139/tcp  open  netbios-ssn Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
445/tcp  open  netbios-ssn Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
512/tcp  open  exec        netkit-rsh rexecd
513/tcp  open  login?
514/tcp  open  shell       Netkit rshd
1099/tcp open  rmiregistry GNU Classpath grmiregistry
1524/tcp open  bindshell   Bash shell (**BACKDOOR**; root shell)
2049/tcp open  nfs         2-4 (RPC #100003)
3306/tcp open  mysql       MySQL 5.0.51a-3ubuntu5
5432/tcp open  postgresql  PostgreSQL DB 8.3.0 - 8.3.7
5900/tcp open  vnc         VNC (protocol 3.3)
6000/tcp open  X11         (access denied)
6667/tcp open  irc         UnrealIRCd
8009/tcp open  ajp13       Apache Jserv (Protocol v1.3)
8180/tcp open  http        Apache Tomcat/Coyote JSP engine 1.1
Service Info: Hosts:  metasploitable.localdomain, localhost, .metasploit.metas
, irc.Metasploitable.LAN; OSs: Unix, Linux; CPE: cpe:/o:linux:linux_kernel
```

STEP 4: VULNERABILITY ASSESSMENT

Machine	Vulnerability	Brief Description
Web Server	**CVE-2010-0425** **CVE-2017-7679** **CVE-2015-1452** **CVE-2012-0031** **CVE-2011-4415**	**CVE-2010-0425** modules/arch/win32/mod_isapi.c in mod_isapi in the Apache HTTP Server 2.0.37 through 2.0.63, 2.2.0 through 2.2.14, and 2.3.x before 2.3.7, when running on Windows, does not ensure that request processing is complete before calling isapi_unload for an ISAPI .dll module, which allows remote attackers to execute arbitrary code via unspecified vectors related to a crafted request, a reset packet, and "orphaned call-back pointers." (Nvd.nist.gov, 2019). This score under version 2 is 10 however with version 3 there is no score assigned, this could be due to the age of the CVE code, with version 3 being too new for any valuable data. **CVE-2017-7679** In Apache httpd 2.2.x before 2.2.33 and 2.4.x before 2.4.26, mod_mime can read one byte past the end of a buffer when sending a malicious Content-Type response header (Nvd.nist.gov, 2019). This CVE scores 9.8 and 7.5 depending on the version of apache version 3 or above is 9.8 and version 2 is 7.5. **CVE-2015-1452** The Control and Provisioning of Wireless Access Points (CAPWAP) daemon in Fortinet FortiOS 5.0 Patch 7 build 4457 allows remote attackers to cause a denial of service (locked CAPWAP Access Controller) via many ClientHello DTLS messages. This CVE only has one score at this moment in time but has been identified across two versions however only one version has a score (Nvd.nist.gov, 2019). The version that has current score of 7.8 is version 2. Version 3 does not have a score assigned to it. **CVE-2012-0031**

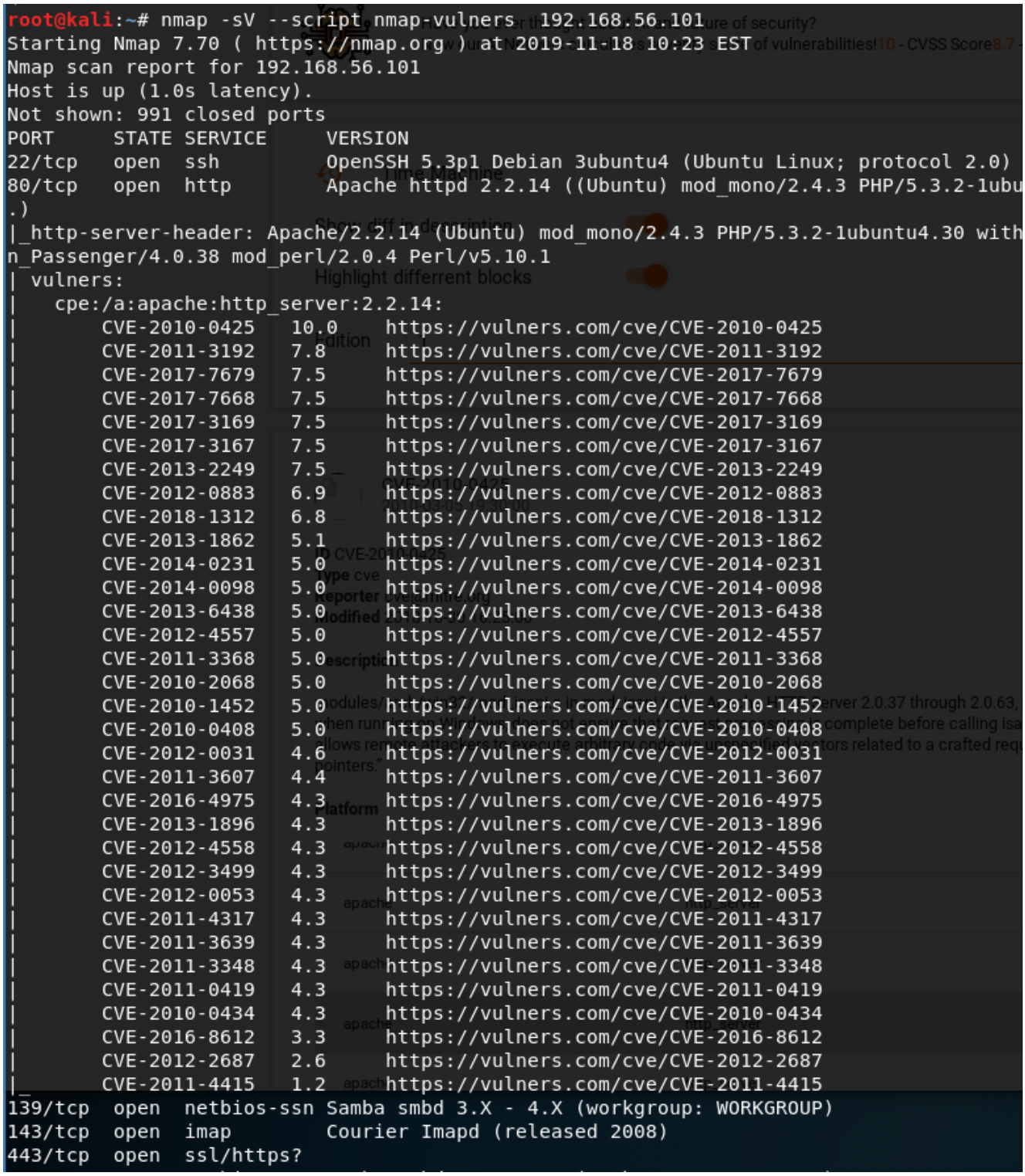
		scoreboard.c in the Apache HTTP Server 2.2.21 and earlier might allow local users to cause a denial of service (daemon crash during shutdown) or possibly have unspecified other impact by modifying a certain type field within a scoreboard shared memory segment, leading to an invalid call to the free function (Nvd.nist.gov, 2019). This CVE has score 4.6 on version 2 for version three there is no score applied. **CVE-2011-4415** The ap_pregsub function in server/util.c in the Apache HTTP Server 2.0.x through 2.0.64 and 2.2.x through 2.2.21, when the mod_setenvif module is enabled, does not restrict the size of values of environment variables, which allows local users to cause a denial of service (memory consumption or NULL pointer dereference) via a .htaccess file with a crafted SetEnvIf directive, in conjunction with a crafted HTTP request header, related to (1) the "len +=" statement and (2) the apr_pcalloc function call, a different vulnerability than CVE-2011-3607 (Nvd.nist.gov, 2019). The score of this on version 2 is 1.2 version 3 has no score assigned.
Database Server	**CVE-2012-1667** **CVE-2008-4163** **CVE-2016-1286** **CVE-2016-1285** **CVE-2010-0290**	**CVE-2012-1667** ISC BIND 9.x before 9.7.6-P1, 9.8.x before 9.8.3-P1, 9.9.x before 9.9.1-P1, and 9.4-ESV and 9.6-ESV before 9.6-ESV-R7-P1 does not properly handle resource records with a zero-length RDATA section, which allows remote DNS servers to cause a denial of service (daemon crash or data corruption) or obtain sensitive information from process memory via a crafted record (Nvd.nist.gov, 2019). This CVE has a score of 8.5 version 2 for version 3 has no score applied to it. **CVE-2008-4163** Unspecified vulnerability in ISC BIND 9.3.5-P2-W1, 9.4.2-P2-W1, and 9.5.0-P2-W1 on Windows allows remote attackers to cause a denial of service (UDP client handler termination) via

		unknown vectors. (Nvd.nist.gov, 2019). This CVE has a score of 7.8 version 2 for version 3 has no score applied to it. **CVE-2016-1286** named in ISC BIND 9.x before 9.9.8-P4 and 9.10.x before 9.10.3-P4 allows remote attackers to cause a denial of service (assertion failure and daemon exit) via a crafted signature record for a DNAME record, related to db.c and resolver.c. (Nvd.nist.gov, 2019). This CVE has a score of 5.0 version 2 for version 3 has a score 7.8 applied to it. **CVE-2016-1285** named in ISC BIND 9.x before 9.9.8-P4 and 9.10.x before 9.10.3-P4 does not properly handle DNAME records when parsing fetch reply messages, which allows remote attackers to cause a denial of service (assertion failure and daemon exit) via a malformed packet to the rndc (aka control channel) interface, related to alist.c and sexpr.c. (Nvd.nist.gov, 2019). This CVE has a score of 4.3 version 2 for version 3 has a score 6.8 applied to it. **CVE-2010-0290** Unspecified vulnerability in ISC BIND 9.0.x through 9.3.x, 9.4 before 9.4.3-P5, 9.5 before 9.5.2-P2, 9.6 before 9.6.1-P3, and 9.7.0 beta, with DNSSEC validation enabled and checking disabled (CD), allows remote attackers to conduct DNS cache poisoning attacks by receiving a recursive client query and sending a response that contains (1) CNAME or (2) DNAME records, which do not have the intended validation before caching, aka Bug 20737. NOTE: this vulnerability exists because of an incomplete fix for CVE-2009-4022 (Nvd.nist.gov, 2019). This CVE has a score of 4.0 version 2 for version 3 has no score applied to it.
Windows 7	**No vulnerabilities discovered**	No vulnerabilities where found when scanning windows with Nmap and Vulners.

	using nmap-vulners. See screenshot in Figure	
Windows XP	**No vulnerabilities discovered using nmap-vulners. See screenshot in Figure**	No vulnerabilities where found when scanning windows with Nmap and Vulners.

VULNERS FOR CVE FOR WEB SERVER (192.168.56.101)

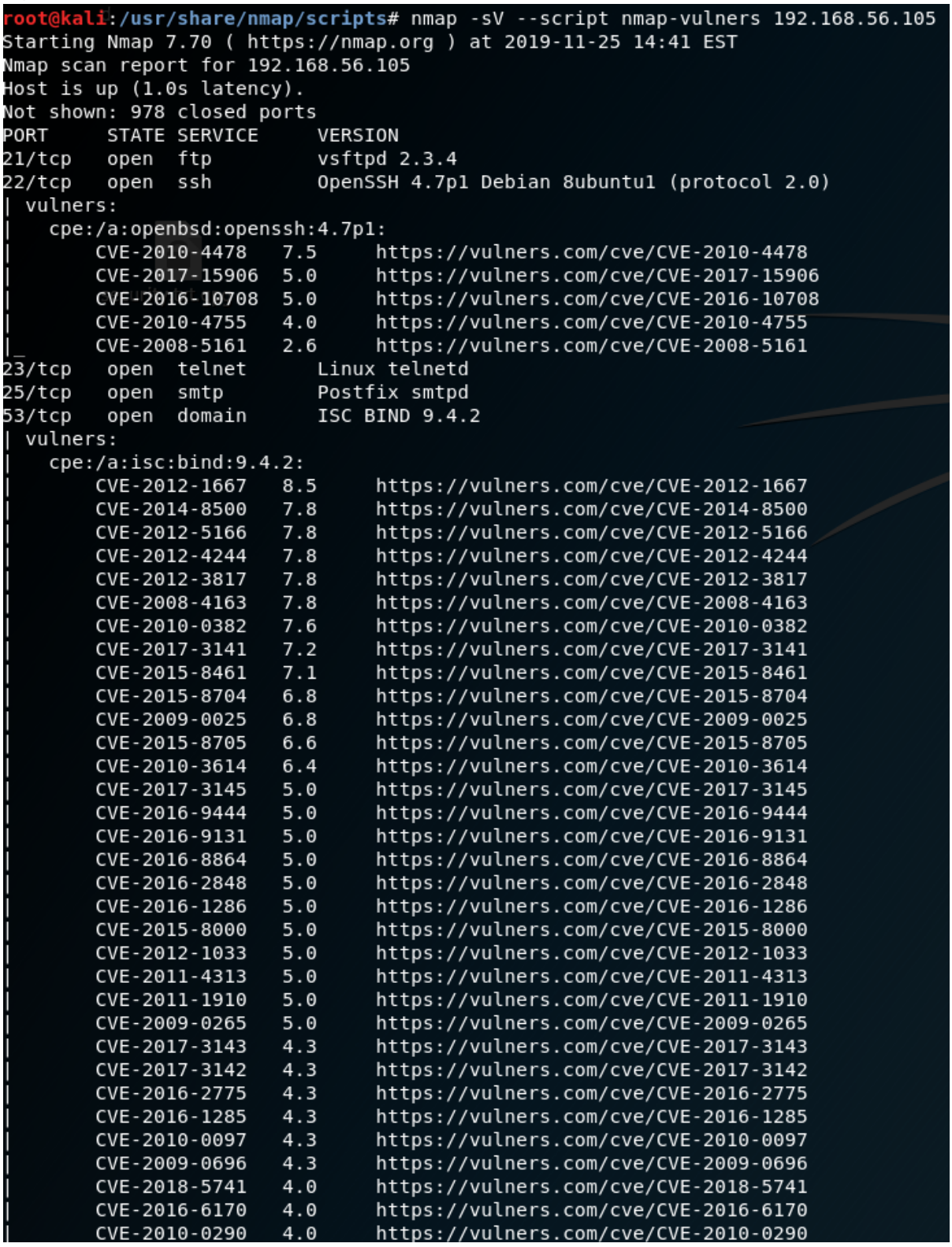
Figure 13



```
root@kali:~# nmap -sV --script nmap-vulners 192.168.56.101
Starting Nmap 7.70 ( https://nmap.org ) at 2019-11-18 10:23 EST
Nmap scan report for 192.168.56.101
Host is up (1.0s latency).
Not shown: 991 closed ports
PORT     STATE SERVICE     VERSION
22/tcp   open  ssh         OpenSSH 5.3p1 Debian 3ubuntu4 (Ubuntu Linux; protocol 2.0)
80/tcp   open  http        Apache httpd 2.2.14 ((Ubuntu) mod_mono/2.4.3 PHP/5.3.2-1ubu
.)
|_http-server-header: Apache/2.2.14 (Ubuntu) mod_mono/2.4.3 PHP/5.3.2-1ubuntu4.30 with
n_Passenger/4.0.38 mod_perl/2.0.4 Perl/v5.10.1
| vulners:
|   cpe:/a:apache:http_server:2.2.14:
|       CVE-2010-0425   10.0    https://vulners.com/cve/CVE-2010-0425
|       CVE-2011-3192   7.8     https://vulners.com/cve/CVE-2011-3192
|       CVE-2017-7679   7.5     https://vulners.com/cve/CVE-2017-7679
|       CVE-2017-7668   7.5     https://vulners.com/cve/CVE-2017-7668
|       CVE-2017-3169   7.5     https://vulners.com/cve/CVE-2017-3169
|       CVE-2017-3167   7.5     https://vulners.com/cve/CVE-2017-3167
|       CVE-2013-2249   7.5     https://vulners.com/cve/CVE-2013-2249
|       CVE-2012-0883   6.9     https://vulners.com/cve/CVE-2012-0883
|       CVE-2018-1312   6.8     https://vulners.com/cve/CVE-2018-1312
|       CVE-2013-1862   5.1     https://vulners.com/cve/CVE-2013-1862
|       CVE-2014-0231   5.0     https://vulners.com/cve/CVE-2014-0231
|       CVE-2014-0098   5.0     https://vulners.com/cve/CVE-2014-0098
|       CVE-2013-6438   5.0     https://vulners.com/cve/CVE-2013-6438
|       CVE-2012-4557   5.0     https://vulners.com/cve/CVE-2012-4557
|       CVE-2011-3368   5.0     https://vulners.com/cve/CVE-2011-3368
|       CVE-2010-2068   5.0     https://vulners.com/cve/CVE-2010-2068
|       CVE-2010-1452   5.0     https://vulners.com/cve/CVE-2010-1452
|       CVE-2010-0408   5.0     https://vulners.com/cve/CVE-2010-0408
|       CVE-2012-0031   4.6     https://vulners.com/cve/CVE-2012-0031
|       CVE-2011-3607   4.4     https://vulners.com/cve/CVE-2011-3607
|       CVE-2016-4975   4.3     https://vulners.com/cve/CVE-2016-4975
|       CVE-2013-1896   4.3     https://vulners.com/cve/CVE-2013-1896
|       CVE-2012-4558   4.3     https://vulners.com/cve/CVE-2012-4558
|       CVE-2012-3499   4.3     https://vulners.com/cve/CVE-2012-3499
|       CVE-2012-0053   4.3     https://vulners.com/cve/CVE-2012-0053
|       CVE-2011-4317   4.3     https://vulners.com/cve/CVE-2011-4317
|       CVE-2011-3639   4.3     https://vulners.com/cve/CVE-2011-3639
|       CVE-2011-3348   4.3     https://vulners.com/cve/CVE-2011-3348
|       CVE-2011-0419   4.3     https://vulners.com/cve/CVE-2011-0419
|       CVE-2010-0434   4.3     https://vulners.com/cve/CVE-2010-0434
|       CVE-2016-8612   3.3     https://vulners.com/cve/CVE-2016-8612
|       CVE-2012-2687   2.6     https://vulners.com/cve/CVE-2012-2687
|_      CVE-2011-4415   1.2     https://vulners.com/cve/CVE-2011-4415
139/tcp  open  netbios-ssn Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
143/tcp  open  imap        Courier Imapd (released 2008)
443/tcp  open  ssl/https?
```

DATABASE SERVER (192.168.56.105)

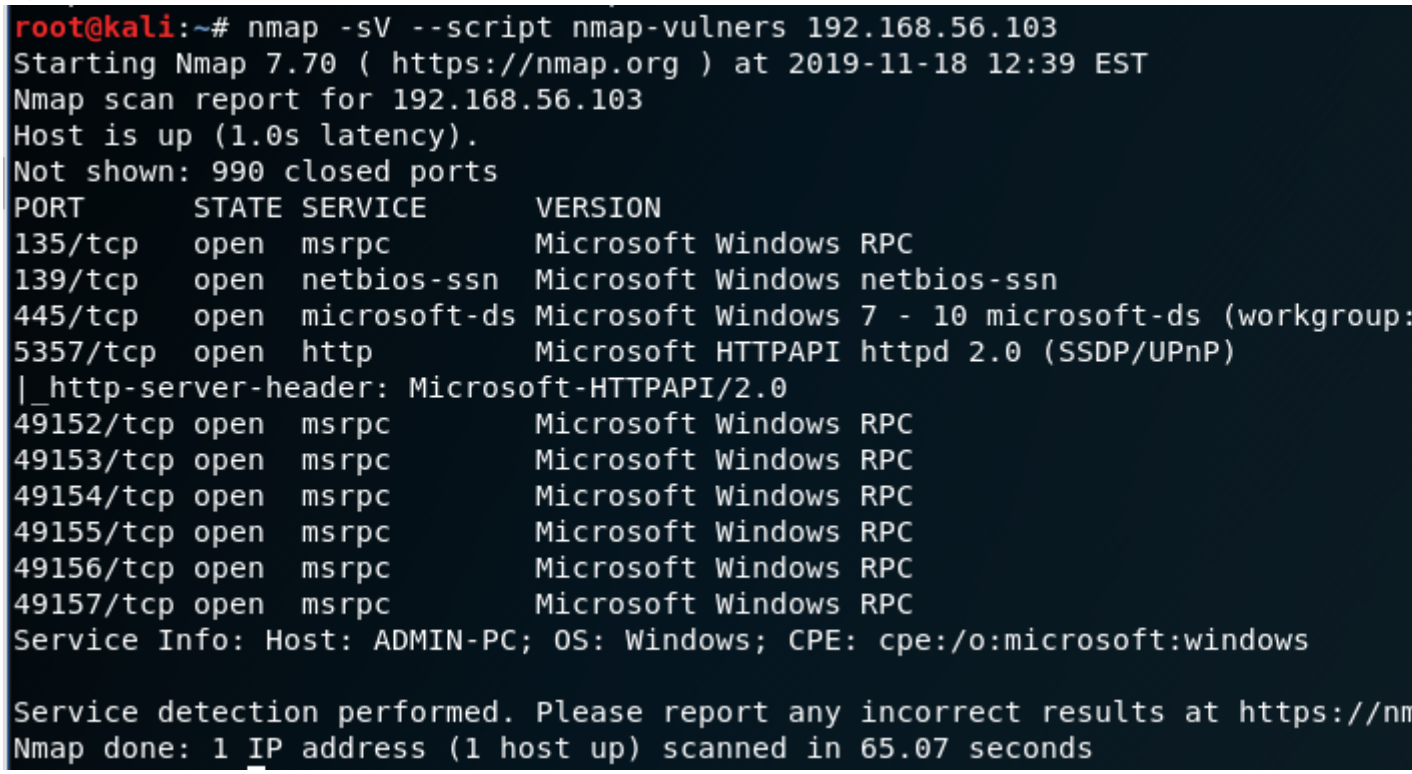
Figure 14



```
root@kali:/usr/share/nmap/scripts# nmap -sV --script nmap-vulners 192.168.56.105
Starting Nmap 7.70 ( https://nmap.org ) at 2019-11-25 14:41 EST
Nmap scan report for 192.168.56.105
Host is up (1.0s latency).
Not shown: 978 closed ports
PORT     STATE SERVICE     VERSION
21/tcp   open  ftp         vsftpd 2.3.4
22/tcp   open  ssh         OpenSSH 4.7p1 Debian 8ubuntu1 (protocol 2.0)
| vulners:
|   cpe:/a:openbsd:openssh:4.7p1:
|       CVE-2010-4478   7.5     https://vulners.com/cve/CVE-2010-4478
|       CVE-2017-15906  5.0     https://vulners.com/cve/CVE-2017-15906
|       CVE-2016-10708  5.0     https://vulners.com/cve/CVE-2016-10708
|       CVE-2010-4755   4.0     https://vulners.com/cve/CVE-2010-4755
|_      CVE-2008-5161   2.6     https://vulners.com/cve/CVE-2008-5161
23/tcp   open  telnet      Linux telnetd
25/tcp   open  smtp        Postfix smtpd
53/tcp   open  domain      ISC BIND 9.4.2
| vulners:
|   cpe:/a:isc:bind:9.4.2:
|       CVE-2012-1667   8.5     https://vulners.com/cve/CVE-2012-1667
|       CVE-2014-8500   7.8     https://vulners.com/cve/CVE-2014-8500
|       CVE-2012-5166   7.8     https://vulners.com/cve/CVE-2012-5166
|       CVE-2012-4244   7.8     https://vulners.com/cve/CVE-2012-4244
|       CVE-2012-3817   7.8     https://vulners.com/cve/CVE-2012-3817
|       CVE-2008-4163   7.8     https://vulners.com/cve/CVE-2008-4163
|       CVE-2010-0382   7.6     https://vulners.com/cve/CVE-2010-0382
|       CVE-2017-3141   7.2     https://vulners.com/cve/CVE-2017-3141
|       CVE-2015-8461   7.1     https://vulners.com/cve/CVE-2015-8461
|       CVE-2015-8704   6.8     https://vulners.com/cve/CVE-2015-8704
|       CVE-2009-0025   6.8     https://vulners.com/cve/CVE-2009-0025
|       CVE-2015-8705   6.6     https://vulners.com/cve/CVE-2015-8705
|       CVE-2010-3614   6.4     https://vulners.com/cve/CVE-2010-3614
|       CVE-2017-3145   5.0     https://vulners.com/cve/CVE-2017-3145
|       CVE-2016-9444   5.0     https://vulners.com/cve/CVE-2016-9444
|       CVE-2016-9131   5.0     https://vulners.com/cve/CVE-2016-9131
|       CVE-2016-8864   5.0     https://vulners.com/cve/CVE-2016-8864
|       CVE-2016-2848   5.0     https://vulners.com/cve/CVE-2016-2848
|       CVE-2016-1286   5.0     https://vulners.com/cve/CVE-2016-1286
|       CVE-2015-8000   5.0     https://vulners.com/cve/CVE-2015-8000
|       CVE-2012-1033   5.0     https://vulners.com/cve/CVE-2012-1033
|       CVE-2011-4313   5.0     https://vulners.com/cve/CVE-2011-4313
|       CVE-2011-1910   5.0     https://vulners.com/cve/CVE-2011-1910
|       CVE-2009-0265   5.0     https://vulners.com/cve/CVE-2009-0265
|       CVE-2017-3143   4.3     https://vulners.com/cve/CVE-2017-3143
|       CVE-2017-3142   4.3     https://vulners.com/cve/CVE-2017-3142
|       CVE-2016-2775   4.3     https://vulners.com/cve/CVE-2016-2775
|       CVE-2016-1285   4.3     https://vulners.com/cve/CVE-2016-1285
|       CVE-2010-0097   4.3     https://vulners.com/cve/CVE-2010-0097
|       CVE-2009-0696   4.3     https://vulners.com/cve/CVE-2009-0696
|       CVE-2018-5741   4.0     https://vulners.com/cve/CVE-2018-5741
|       CVE-2016-6170   4.0     https://vulners.com/cve/CVE-2016-6170
|       CVE-2010-0290   4.0     https://vulners.com/cve/CVE-2010-0290
```

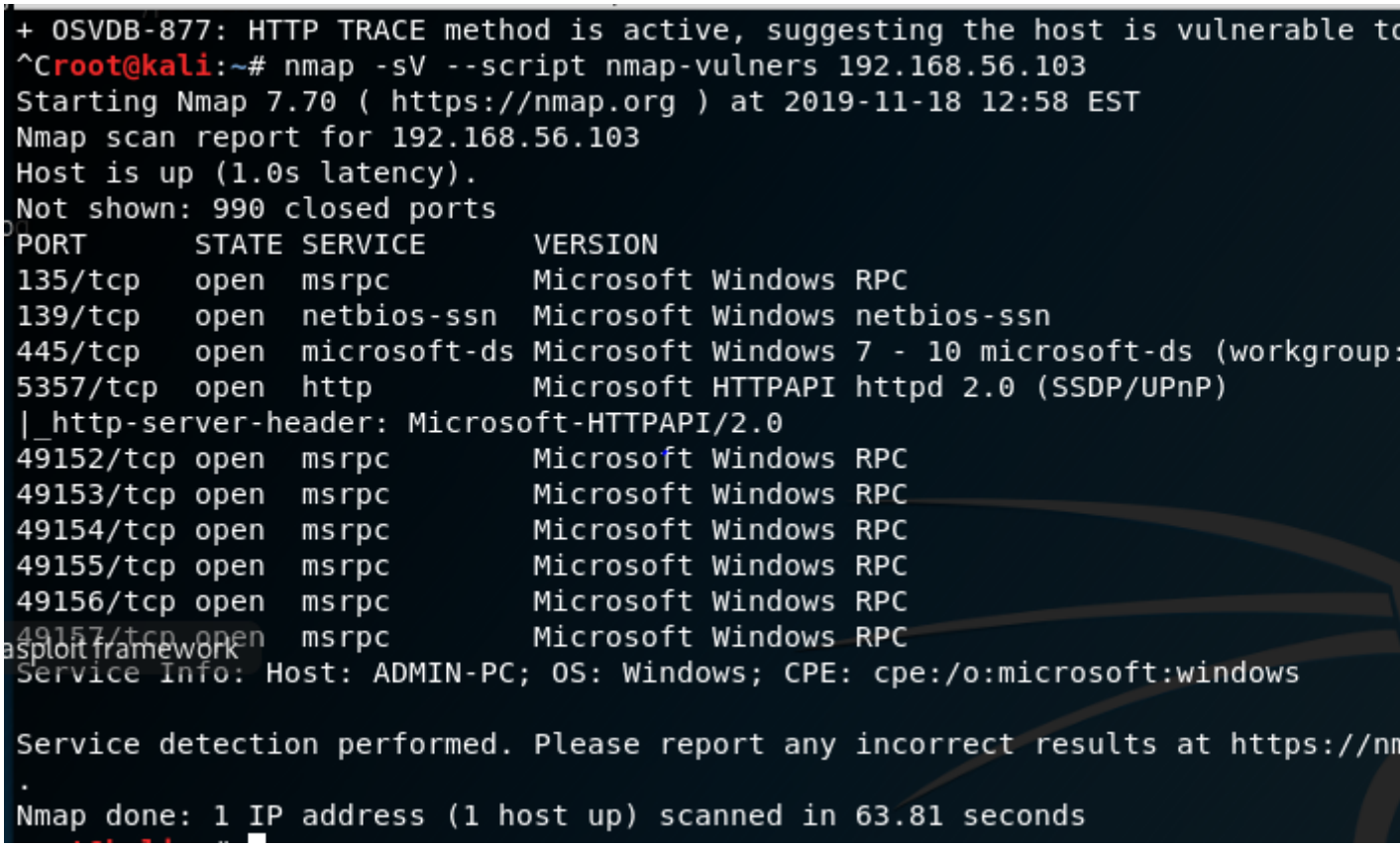
WINDOWS 7 (192.168.56.103)

Figure 15



WINDOWS XP (192.168.56.104)

Figure 16



STEP 5: VULNERABILITY ASSESSMENT OF WEB SERVER

The information within this table can be found within figure 13 above.

Vulnerability	Brief Description	Vendor Fix
CVE-2017-7668	"The HTTP strict parsing changes added in Apache httpd 2.2.32 and 2.4.24 introduced a bug in token list parsing, which allows ap_find_token to search past the end of its input string. By maliciously crafting a sequence of request headers, an attacker may be able to cause a segmentation fault, or to force ap_find_token to return an incorrect value." (Nvd.nist.gov, 2019). This CVE has two scores version 2 is a score of 7.5 and version 3 is a score of 9.8	The fix for this was apache version 2.2.32 patch or upgrade to version 2.2.33. An update was released on 19th June 2017.
CVE-2017-3169	"In Apache httpd 2.2.x before 2.2.33 and 2.4.x before 2.4.26, mod_ssl may dereference a NULL pointer when third-party modules call ap_hook_process_connection() during an HTTP request to an HTTPS port." (Nvd.nist.gov, 2019). This CVE has a score under version 2 of 7.5 and a score of 9.8 on version 3.	The fix for this was apache version 2.2.32 patch or upgrade to version 2.2.33 an update was released on 19th June 2017
CVE-2011-3368	"The mod_proxy module in the Apache HTTP Server 1.3.x through 1.3.42, 2.0.x through 2.0.64, and 2.2.x through 2.2.21, when the Revision 1179239 patch is in place, does not properly interact with use of (1) RewriteRule and (2) ProxyPassMatch pattern matches for configuration of a reverse proxy, which allows remote attackers to send requests to intranet servers via a malformed URI containing an @ (at sign) character and a : (colon) character in invalid positions. This CVE has a score of 4.3 on version 2 and no	No fix or patch could be found

	score applied for version 3.” (Nvd.nist.gov, 2019). This CVE exists because “NOTE: this vulnerability exists because of an incomplete fix for CVE-2011-3368.”.	
CVE-2016-8612	“Apache HTTP Server mod_cluster before version httpd 2.4.23 is vulnerable to an Improper Input Validation in the protocol parsing logic in the load balancer resulting in a Segmentation Fault in the serving httpd process.” (Nvd.nist.gov, 2019). The score for this CVE is 3.3 for version 2 and a score of 4.3 for version 3.	No fix or patch could be found.
CVE-2012-2687	“Multiple cross-site scripting (XSS) vulnerabilities in the make_variant_list function in mod_negotiation.c in the mod_negotiation module in the Apache HTTP Server 2.4.x before 2.4.3, when the MultiViews option is enabled, allow remote attackers to inject arbitrary web script or HTML via a crafted filename that is not properly handled during construction of a variant list.” (Nvd.nist.gov, 2019). This CVE has a score on version 2 of 2.6 on version 2 and for version 3 there is no score applied.	This affects versions 2.4.2 and 2.4.1 an update was released to patch this on 21st August 2012

All references within the brief description relate to vendor fix.

Step 5.1: Vulnerability Assessment of Database Server

Vulnerability	Brief Description	Vendor Fix
Database Server	**CVE-2012-1667** “ISC BIND 9.x before 9.7.6-P1, 9.8.x before 9.8.3-P1, 9.9.x before 9.9.1-P1, and 9.4-ESV and 9.6-ESV before 9.6-ESV-R7-P1 does not properly handle resource records with a zero-	Workarounds are currently being investigated, but none are currently known.

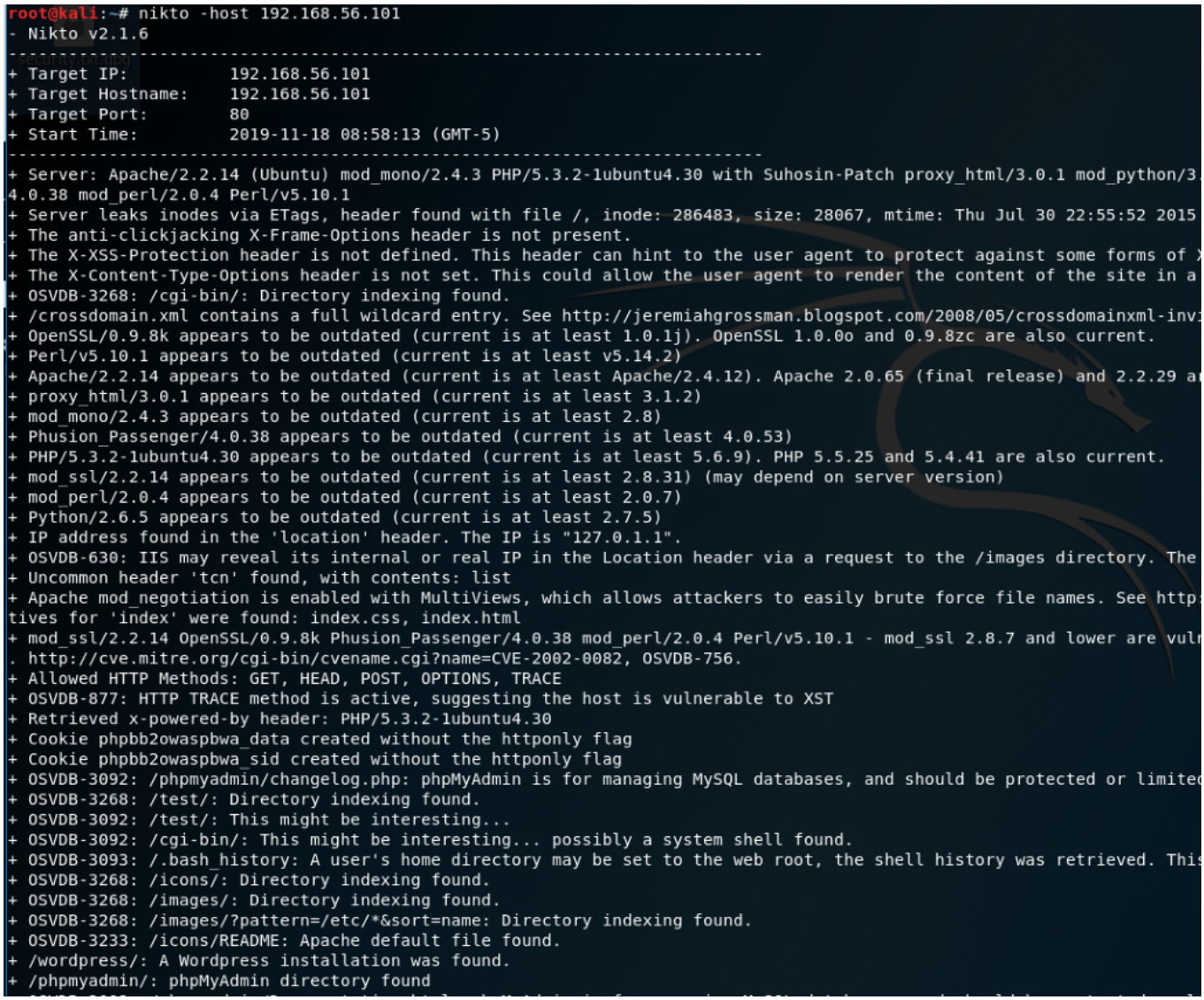
	length RDATA section, which allows remote DNS servers to cause a denial of service (daemon crash or data corruption) or obtain sensitive information from process memory via a crafted record" (Nvd.nist.gov, 2019). This CVE has a score of 8.5 version 2 for version 3 has no score applied to it.	
Database Server	**CVE-2008-4163** "Unspecified vulnerability in ISC BIND 9.3.5-P2-W1, 9.4.2-P2-W1, and 9.5.0-P2-W1 on Windows allows remote attackers to cause a denial of service (UDP client handler termination) via unknown vectors." (Nvd.nist.gov, 2019). This CVE has a score of 7.8 version 2 for version 3 has no score applied to it.	Apply update from the vendor, newer versions fix this vulnerability.
Database Server	**CVE-2016-1286** "named in ISC BIND 9.x before 9.9.8-P4 and 9.10.x before 9.10.3-P4 allows remote attackers to cause a denial of service (assertion failure and daemon exit) via a crafted signature record for a DNAME record, related to db.c and resolver.c." (Nvd.nist.gov, 2019). This CVE has a score of 5.0 version 2 for version 3 has a score 7.8 applied to it.	Apply latest update from the vendor.
Database Server	**CVE-2016-1285** "named in ISC BIND 9.x before 9.9.8-P4 and 9.10.x before 9.10.3-P4 does not properly handle DNAME records when parsing fetch reply messages, which allows remote attackers to cause a denial of service (assertion failure and daemon exit) via a malformed packet to the rndc (aka control channel) interface, related	Apply latest update from the vendor.

	to alist.c and sexpr.c." (Nvd.nist.gov, 2019). This CVE has a score of 4.3 version 2 for version 3 has a score 6.8 applied to it.	
Database Server	**CVE-2010-0290** "Unspecified vulnerability in ISC BIND 9.0.x through 9.3.x, 9.4 before 9.4.3-P5, 9.5 before 9.5.2-P2, 9.6 before 9.6.1-P3, and 9.7.0 beta, with DNSSEC validation enabled and checking disabled (CD), allows remote attackers to conduct DNS cache poisoning attacks by receiving a recursive client query and sending a response that contains (1) CNAME or (2) DNAME records, which do not have the intended validation before caching, aka Bug 20737. NOTE: this vulnerability exists because of an incomplete fix for CVE-2009-4022" (Nvd.nist.gov, 2019). This CVE has a score of 4.0 version 2 for version 3 has no score applied to it.	Apply latest update from the vendor.

All references within the brief description relate to vendor fix.

NIKTO –HOST IP_ADDRESS –PORT 80

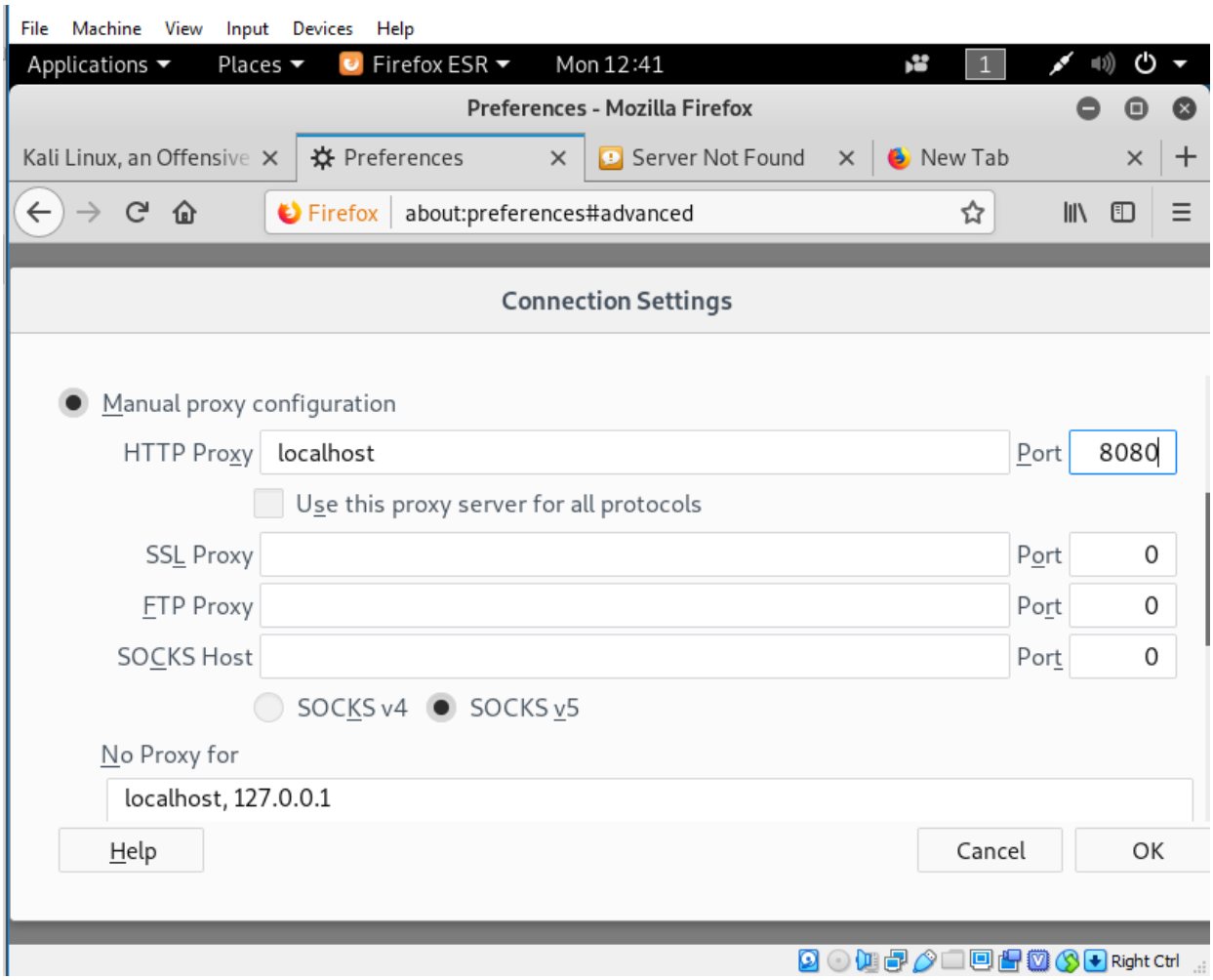
Figure 17



STEP 6: BURP SUITE PROXY

In this section Burp Suite has been used to carry out an SQL Injection Attack. This application is built into Kali Linux but also has two versions, the free edition and the professional edition. The free version has features allowing a user to discover and exploit the SQL Injection.

Figure 18



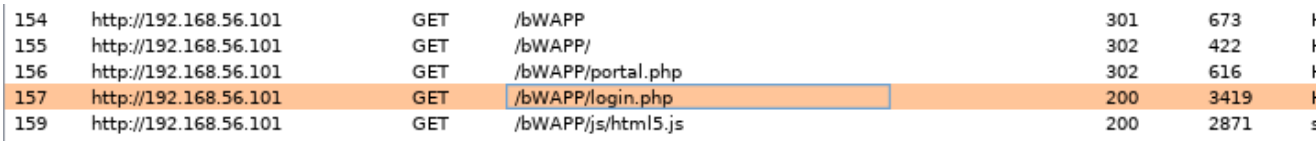
After using the “netdiscover” and “nikto -host” command, the web server IP address was given back. The IP address is 192.168.56.101. After this, http:/192.168.56.x/bWAPP was opened on a web browser, using the username “bee” and entering in “bug” as the password allowed for the SQL Injection page in Burp Suite to open.

Figure 19

In the “Search for a movie” box, a single quota was written to return the below results.

In the place where the single quota was placed a script is written using SQL Injection. Below in figures 19 and 20, it shows queries being changed within the database using Burp, after this more information is required to be gathered.

Figure 20



154	http://192.168.56.101	GET	/bWAPP	301	673	
155	http://192.168.56.101	GET	/bWAPP/	302	422	
156	http://192.168.56.101	GET	/bWAPP/portal.php	302	616	
157	http://192.168.56.101	GET	/bWAPP/login.php	200	3419	
159	http://192.168.56.101	GET	/bWAPP/js/html5.js	200	2871	

Using command below it gathered version of the host server.

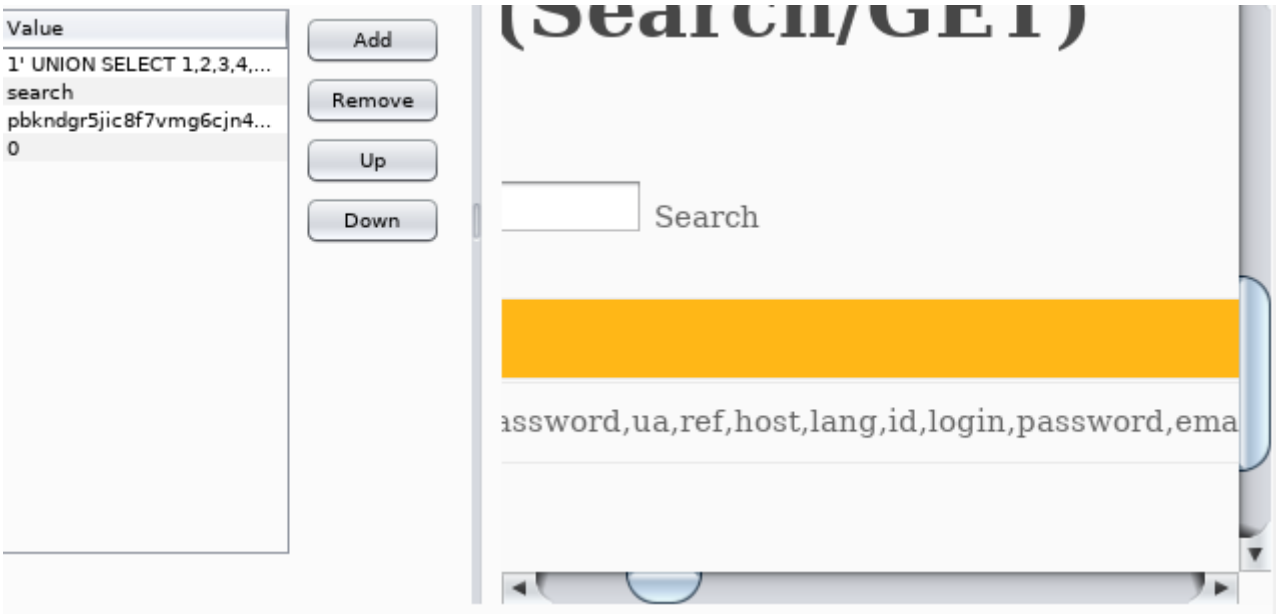
1’ UNION SELECT 1,2,3,4, version(),6,7--+

Figure 21

Next step is look for lack of database security. With this there can be set queries which allow the database to search the table GROUP_CONCAT(table_name). An attacker can use this type of command to get to know the structure of databases.

1’ UNION SELECT 1,2,3,4,GROUP_CONCAT(table_name),6,7 FROM information_schema.tables WHERE table_schema = DATABASE()--+

Figure 22



The next step in exploiting a database with SQL Injection is stealing information from the service. The crucial information in this case would be login and passwords. In more advanced cases it can also steal financial information or more valuable data. The screenshot below shows the password hash.

1' UNION SELECT 1,2,3,4,GROUP_CONCAT(login,password),6,7 FROM users--+

Figure 23

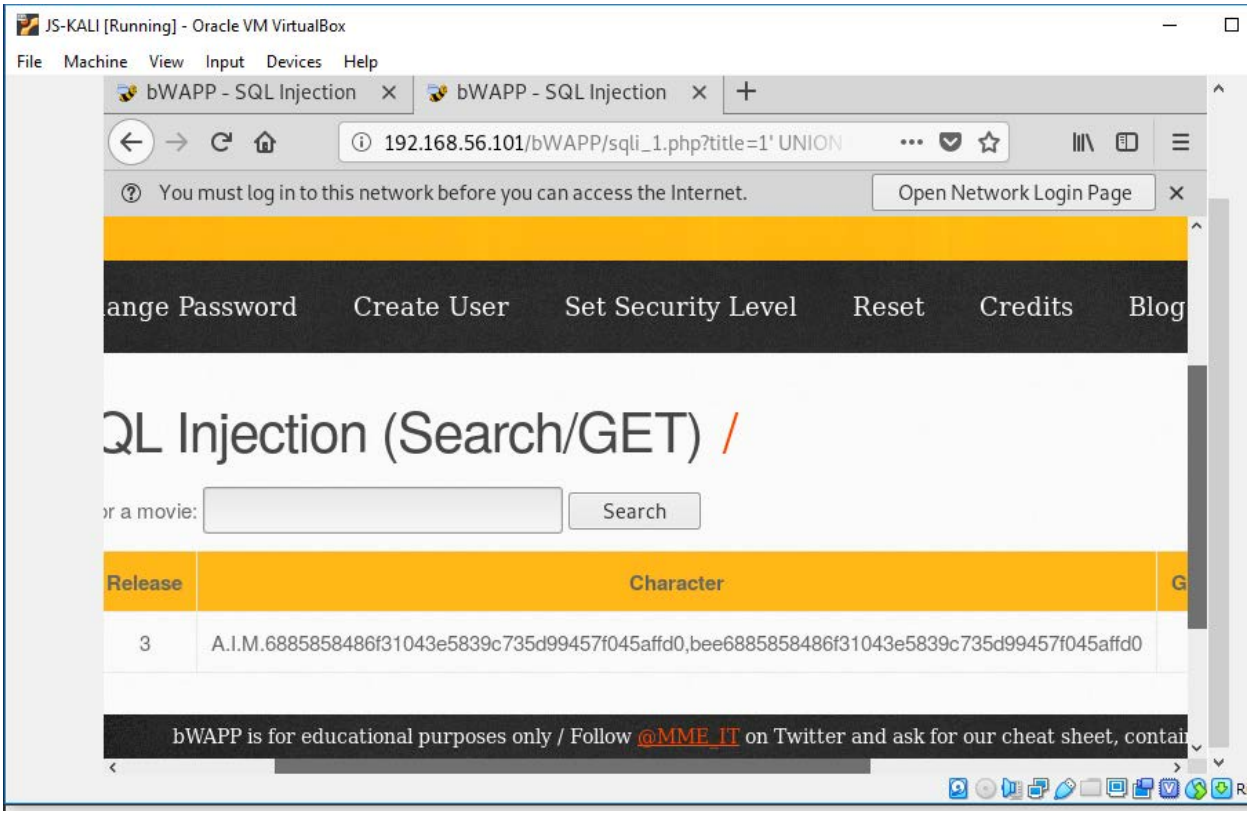
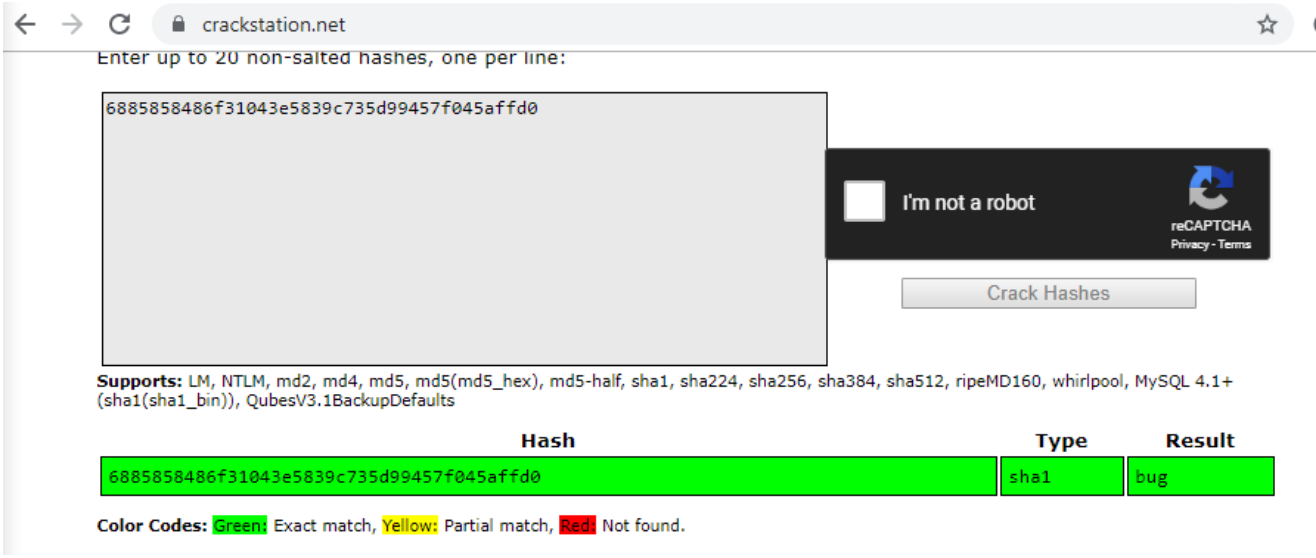


Figure 24 shows the hashed password decrypted. By copying the discovered hash password into the text box which cracks it, it comes back with a green match which indicates that the password was decrypted successfully.

Figure 24



Page Break

CONCLUSION

Within the portfolio, the network needed to be set up before penetration testing could commence. The network for The Happy Shop Inc consisted of a database server, a web server, a Windows 7 machine and an old but usable Windows XP machine. It was uncertain if the servers and machines were secure and free from vulnerabilities so HackBay Pvt Ltd, the team being posed as undertook a penetration test. Using port-scanning as seen in figures 2-12, allowed for all open ports of each machine on the network to be identified as well as the operating systems they use. This gives an idea of how vulnerable a system or entire network might be.

Nmap Vulners was used to identify the vulnerabilities within the network on each machine, it was suspected that Windows XP would be the most vulnerable due to being unsupported, this was not the case. Multiple vulnerabilities were found on both the database and web server, they had multiple CVE codes related to them, these were investigated, and multiple fixes were identified. If these vulnerabilities were not discovered, the servers could have been easily hacked in the future which would have led to both confidential and sensitive information being leaked. Most of the vulnerabilities could be resolved through updating the services and operating systems alike, this could be done through an Active Directory with an admin in control where these can be deployed seamlessly.

The rule of thumb to come from this conclusion is that anything can be vulnerable, the only real solution is to rely on services having a newer version available and keeping systems up to date, sometimes an older version may not have any vulnerabilities, but it is still best to keep updated.

REFERENCES PORTFOLIO 3

ATOUM, J.O. AND QARALLEH, A.J., 2014. A hybrid technique for SQL injection attacks detection and prevention. International Journal of Database Management Systems, 6(1), p.21.

BALOCH, R., 2014. Ethical Hacking and Penetration Testing Guide.

BANKS, J., 2015, "The Heartbleed bug: Insecurity repackaged, rebranded and resold", Crime, Media, Culture: An International Journal, vol. 11, no. 3, pp. 259-279.

FRUHLINGER, J., 2017. What is the Heartbleed bug, how does it work and how was it fixed?. [online] CSO Online. Available at: https://www.csoonline.com/article/3223203/what-is-the-heartbleed-bug-how-does-it-work-and-how-was-it-fixed.html [Accessed 18 Nov. 2019].

GAJAWADA, A., 2016. Heartbleed bug: How it works and how to avoid similar bugs. [online] Software Integrity Blog. Available at: https://www.synopsys.com/blogs/software-security/heartbleed-bug/ [Accessed 18 Nov. 2019].

GUPTA, S. & GUPTA, B.B. 2017, "Cross-Site Scripting (XSS) attacks and defense mechanisms: classification and state-of-the-art", International Journal of System Assurance Engineering and Management, vol. 8, no. S1, pp. 512-530.

HALFOND, W.G., VIEGAS, J. AND ORSO, A., 2006, March. A classification of SQL-injection attacks and countermeasures. In Proceedings of the IEEE International Symposium on Secure Software Engineering (Vol. 1, pp. 13-15). IEEE.

Heartbleed.com., 2014. Heartbleed Bug. [online] Available at: http://heartbleed.com/ [Accessed 18 Nov. 2019].

HUANG, H., ZHANG, Z., CHENG, H. & SHIEH, S.W. 2017, "Web Application Security: Threats, Countermeasures, and Pitfalls", Computer, vol. 50, no. 6, pp. 81-85

RODRÍGUEZ, G.E., TORRES, J.G., FLORES, P. & BENAVIDES, D.E. 2019, "Cross-Site Scripting (XSS) Attacks And Mitigation: A Survey", Computer Networks, , pp. 106960.

RUIZ, G., 2018. *OWASP Top 10 Security Risks – Part I*. [online] Blog.sucuri.net. Available at: https://blog.sucuri.net/2018/10/owasp-top-10-security-risks-part-i.html [Accessed 25 Nov. 2019].

RUIZ, G., 2019. OWASP Top 10 Security Risks – Part IV. Blog.sucuri.net [online]. Available from: https://blog.sucuri.net/2019/01/owasp-top-10-security-risks-part-iv.html [Accessed 16 November 2019].

SINGH, V., 2017. What is HTTP Request, Request Line, Request Header & Request Body?. TOOLSQA [online]. Available from: https://www.toolsqa.com/client-server/http-request/ [Accessed 17 November 2019].

Group, D. (2019). *httpd 2.4 vulnerabilities - The Apache HTTP Server Project*. [online]
Nvd.nist.gov. (2019). *NVD - Home*. [online] Available at: https://nvd.nist.gov/ [Accessed 27 Nov. 2019].

Nvd.nist.gov, 2019. *NVD - CVE-2008-4163*. [online] Available at: https://nvd.nist.gov/vuln/detail/CVE-2008-4163 [Accessed 29 Nov. 2019].
Nvd.nist.gov. (2019). *NVD - CVE-2010-0290*. [online] Available at: https://nvd.nist.gov/vuln/detail/CVE-2010-0290 [Accessed 29 Nov. 2019].
Nvd.nist.gov. (2019). *NVD - CVE-2010-0425*. [online] Available at: https://nvd.nist.gov/vuln/detail/CVE-2010-0425 [Accessed 27 Nov. 2019].

Nvd.nist.gov. (2019). *NVD - CVE-2011-4317*. [online] Available at: https://nvd.nist.gov/vuln/detail/CVE-2011-4317 [Accessed 27 Nov. 2019].
Nvd.nist.gov. (2019). *NVD - CVE-2011-4415*. [online] Available at: https://nvd.nist.gov/vuln/detail/CVE-2011-4415 [Accessed 27 Nov. 2019].
Nvd.nist.gov. (2019). *NVD - CVE-2012-0031*. [online] Available at: https://nvd.nist.gov/vuln/detail/CVE-2012-0031 [Accessed 27 Nov. 2019].
Nvd.nist.gov. (2019). *NVD - CVE-2012-1667*. [online] Available at: https://nvd.nist.gov/vuln/detail/CVE-2012-1667 [Accessed 29 Nov. 2019].
Nvd.nist.gov. (2019). *NVD - CVE-2015-1452*. [online] Available at: https://nvd.nist.gov/vuln/detail/CVE-2015-1452 [Accessed 27 Nov. 2019].
Nvd.nist.gov. (2019). *NVD - CVE-2016-1285*. [online] Available at: https://nvd.nist.gov/vuln/detail/CVE-2016-1285 [Accessed 29 Nov. 2019].
Nvd.nist.gov. (2019). *NVD - CVE-2016-1286*. [online] Available at: https://nvd.nist.gov/vuln/detail/CVE-2016-1286 [Accessed 29 Nov. 2019].
Nvd.nist.gov. (2019). *NVD - CVE-2016-8612*. [online] Available at: https://nvd.nist.gov/vuln/detail/CVE-2016-8612 [Accessed 27 Nov. 2019].
Nvd.nist.gov. (2019). *NVD - CVE-2017-3169*. [online] Available at: https://nvd.nist.gov/vuln/detail/CVE-2017-3169 [Accessed 27 Nov. 2019].
Nvd.nist.gov. (2019). *NVD - CVE-2017-7668*. [online] Available at: https://nvd.nist.gov/vuln/detail/CVE-2017-7668 [Accessed 27 Nov. 2019].
Nvd.nist.gov. (2019). *NVD - CVE-2017-7679*. [online] Available at: https://nvd.nist.gov/vuln/detail/CVE-2017-7679 [Accessed 27 Nov. 2019].