Experiment No. 1

Substitution/monoalphabetic:

```
def main():
   str1 = input("Enter string :")
   lst =
[ 'a','b','c','d','e','f','g','h','i','j','k','l','m','n','o','p','q','r','s','t','u','v','w','x','y','z','A','B','C','D','E','F','
G','H','I','J','K','L','M','N','O','P','Q','R','S','T','U','V','W','X','Y','Z']
   shift = int(input("Enter shift :")) # shift is the number of positions to shift the character usually 3
result = ""
    # loops through the string.
   for char in str1:
      # checks if the character is in the list        if char in lst:
         # shifts the character by the number of positions            result = result + lst[(lst.index(char) +
shift)]        else:
         result = result + char     print("Encrypted string is : ", result)     print("Decrypted string is : ", str1) if
__name__ == "__main__":
main()
```

Output:

```
Enter string :ravi
Enter shift :4
Encrypted string is :  vezm
Decrypted string is :  ravi
```

Polyalphabetic/Transposition:

```
def generate_key(plaintext, key):     key = list(key)
 if len(plaintext) == len(key):
      return key     else:
      for i in range(len(plaintext) - len(key)):
         key.append(key[i % len(key)])     return "".join(key)
```

```
def vigenere_encrypt(plaintext, key):     key = generate_key(plaintext, key)     ciphertext = []


   for i in range(len(plaintext)):
      char = plaintext[i]
 if char.isalpha():  # Only process alphabetic characters
 shift = ord(key[i].lower()) - ord('a')
 if char.islower():
            encrypted_char = chr((ord(char) - ord('a') + shift) % 26 + ord('a'))
         else:
            encrypted_char = chr((ord(char) - ord('A') + shift) % 26 + ord('A'))
ciphertext.append(encrypted_char)
      else:
         ciphertext.append(char)
   return "".join(ciphertext)


plaintext = "Hello World!" key = "RAVI"
ciphertext = vigenere_encrypt(plaintext, key) print("Ciphertext:", ciphertext)
```

Output:

Ciphertext: Yegtf Rwily!

Experiment No. 2

```
import random
from math import gcd

def power(base, expo, mod):
res = 1
base = base % mod
while expo > 0:
if expo & 1:
res = (res * base) % mod
base = (base * base) % mod
expo //= 2
return res

def compute_d(e, phi):
k = 1
while True:
d = ((k * phi) + 1) / e
if d.is_integer():
return int(d)
k += 1

def is_prime(n):
if n < 2:
return False
for i in range(2, int(n ** 0.5) + 1):
if n % i == 0:
return False
```

```
return True

def generate_keys(p, q, e):
if not (is_prime(p) and is_prime(q) and p != q):
raise ValueError("Both numbers must be prime and distinct.")
n = p * q
phi = (p - 1) * (q - 1)
if gcd(e, phi) != 1:
raise ValueError("e must be coprime to phi(n)")
d = compute_d(e, phi)
return e, d, n

def encrypt(message, e, n):
return power(message, e, n)

def decrypt(ciphertext, d, n):
return power(ciphertext, d, n)

if __name__ == "__main__":
try:
p = int(input("Enter a prime number (p): "))
q = int(input("Enter another prime number (q): "))
e = int(input("Enter a value for e (must be coprime with phi(n)): "))

e, d, n = generate_keys(p, q, e)
print(f"Public Key (e, n): ({e}, {n})")
print(f"Private Key (d, n): ({d}, {n})")

M = int(input("Enter a number to encrypt: "))
```

```
C = encrypt(M, e, n)
print(f"Encrypted Message: {C}")
decrypted = decrypt(C, d, n)
print(f"Decrypted Message: {decrypted}")
except ValueError as ve:
print(f"Error: {ve}")
```

Output:-

1]

```
Enter a prime number (p): 7
Enter another prime number (q): 11
Enter a value for e (must be coprime with phi(n)): 17
Public Key (e, n): (17, 77)
Private Key (d, n): (53, 77)
Enter a number to encrypt: 31
Encrypted Message: 26
Decrypted Message: 31
```

2]

```
Enter a prime number (p): 61
Enter another prime number (q): 53
Enter a value for e (must be coprime with phi(n)): 17
Public Key (e, n): (17, 3233)
Private Key (d, n): (2753, 3233)
Enter a number to encrypt: 345
Encrypted Message: 2350
Decrypted Message: 345
```

Experiment No.3

DH algo:-

```
import random

def mod_exp(base, exponent, mod):
return pow(base, exponent, mod)

# User input for prime number and primitive root
p = int(input("Enter a prime number (p): "))
g = int(input("Enter a primitive root (g): "))

# User input for private keys
a = int(input("Enter Alice's private key: "))
b = int(input("Enter Bob's private key: "))

# Compute public keys
A = mod_exp(g, a, p) # A = g^a mod p
B = mod_exp(g, b, p) # B = g^b mod p

# Compute the shared secret key
shared_secret_Alice = mod_exp(B, a, p) # (B^a) mod p
shared_secret_Bob = mod_exp(A, b, p) # (A^b) mod p

# The shared secret should be the same for both
assert shared_secret_Alice == shared_secret_Bob

# Print results
print(f"\nPublic Parameters: p={p}, g={g}")
print(f"Alice's Private Key: {a}")
```

```
print(f"Bob's Private Key: {b}")
print(f"Alice's Public Key: {A}")
print(f"Bob's Public Key: {B}")
print(f"Shared Secret Key: {shared_secret_Alice}")
```

Output:

```
Public Parameters: p=7, g=5
Alice's Private Key: 12
Bob's Private Key: 56
Alice's Public Key: 1
Bob's Public Key: 4
Shared Secret Key: 1
```

Experiment No.4

Microsoft Windows [Version 10.0.26100.3194]

(c) Microsoft Corporation. All rights reserved.

C:\Users\saurabhs>nmap --version

Nmap version 7.95 (https://nmap.org)

Platform: i686-pc-windows-windows

Compiled with: nmap-liblua-5.4.6 openssl-3.0.13 nmap-libssh2-1.11.0 nmap-libz-1.3.1 nmap-libpcre2-10.43 Npcap-1.79 nmap-libdnet-1.12 ipv6

Compiled without:

Available nsock engines: iocp poll select

#Scan Your Own Machine (Localhost)

C:\Users\saurabhs>ipconfig

Windows IP Configuration

Wireless LAN adapter Local Area Connection* 1:

Media State . . . . . : Media disconnected

Connection-specific DNS Suffix . :

Wireless LAN adapter Local Area Connection* 2:

Media State . . . . . : Media disconnected

Connection-specific DNS Suffix . :

Wireless LAN adapter Wi-Fi:

Connection-specific DNS Suffix . :

Link-local IPv6 Address . . . . . : fe80::1788:907a:98b4:85bf%6

IPv4 Address. . . . . : 192.168.0.104

Subnet Mask . . . . . : 255.255.255.0

Default Gateway . . . . . : 192.168.0.1

Ethernet adapter Ethernet:

Media State . . . . . : Media disconnected

Connection-specific DNS Suffix . :

#Ping Scan (Check if your device is up)

C:\Users\saurabhs>nmap -sn 127.0.0.1

Starting Nmap 7.95 (https://nmap.org) at 2025-02-26 11:41 India Standard Time

Nmap scan report for localhost (127.0.0.1)

Host is up.

Nmap done: 1 IP address (1 host up) scanned in 8.62 seconds

#TCP Port Scan (Check for open TCP ports)

C:\Users\saurabhs>nmap -sT 127.0.0.1

Starting Nmap 7.95 (https://nmap.org) at 2025-02-26 11:44 India Standard Time

Nmap scan report for localhost (127.0.0.1)

Host is up (0.0029s latency).

Not shown: 997 filtered tcp ports (no-response)

PORT STATE SERVICE

135/tcp open msrpc

445/tcp open microsoft-ds

7070/tcp open realserver

Nmap done: 1 IP address (1 host up) scanned in 14.04 seconds

#UDP Port Scan (Check for open UDP ports)

C:\Users\saurabhs>nmap -sU 127.0.0.1

Starting Nmap 7.95 (https://nmap.org) at 2025-02-26 11:45 India Standard Time

Nmap scan report for localhost (127.0.0.1)

Host is up (0.00034s latency).

Not shown: 993 closed udp ports (port-unreach)

PORT STATE SERVICE

123/udp open|filtered ntp

137/udp open|filtered netbios-ns

1900/udp open|filtered upnp

4500/udp open|filtered nat-t-ike

5050/udp open|filtered mmcc

5353/udp open|filtered zeroconf

5355/udp open|filtered llmnr

Nmap done: 1 IP address (1 host up) scanned in 182.92 seconds

#OS Fingerprinting (Try to detect the operating system)

C:\Users\saurabhs>nmap -O 192.168.0.104

Starting Nmap 7.95 (https://nmap.org) at 2025-02-26 11:49 India Standard Time

Nmap scan report for 192.168.0.104

Host is up (0.00037s latency).

Not shown: 996 closed tcp ports (reset)

PORT STATE SERVICE

135/tcp open msrpc

139/tcp open netbios-ssn

445/tcp open microsoft-ds

7070/tcp open realserver

TCP/IP fingerprint:

OS:SCAN(V=7.95%E=4%D=2/26%OT=135%CT=1%CU=32250%PV=Y%DS=0%DC=L%G=Y%TM=67BEB2

OS:7D%P=i686-pc-windows-windows)SEQ(SP=100%GCD=1%ISR=109%TI=I%CI=I%II=I%SS=

OS:S%TS=A)SEQ(SP=101%GCD=1%ISR=10D%TI=I%CI=I%II=I%SS=S%TS=A)SEQ(SP=103%GCD=

OS:1%ISR=10A%TI=I%CI=I%II=I%SS=S%TS=A)SEQ(SP=104%GCD=1%ISR=10B%TI=I%CI=I%II

OS:=I%SS=S%TS=A)SEQ(SP=FC%GCD=1%ISR=10B%TI=I%CI=I%II=I%SS=S%TS=A)OPS(O1=MFF

OS:D7NW8ST11%O2=MFFD7NW8ST11%O3=MFFD7NW8NNT11%O4=MFFD7NW8ST11%O5=MFFD7NW8
ST

OS:11%O6=MFFD7ST11)WIN(W1=FFFF%W2=FFFF%W3=FFFF%W4=FFFF%W5=FFFF%W6=FFFF)ECN(

OS:R=Y%DF=Y%T=80%W=FFFF%O=MFFD7NW8NNS%CC=N%Q=)T1(R=Y%DF=Y%T=80%S=O%A=S+%F=A

OS:S%RD=0%Q=)T2(R=Y%DF=Y%T=80%W=0%S=Z%A=S%F=AR%O=%RD=0%Q=)T3(R=Y%DF=Y%T=80%

OS:W=0%S=Z%A=O%F=AR%O=%RD=0%Q=)T4(R=Y%DF=Y%T=80%W=0%S=A%A=O%F=R%O=%RD=0%Q=)

OS:T5(R=Y%DF=Y%T=80%W=0%S=Z%A=S+%F=AR%O=%RD=0%Q=)T6(R=Y%DF=Y%T=80%W=0%S=A%A

OS:=O%F=R%O=%RD=0%Q=)T7(R=Y%DF=Y%T=80%W=0%S=Z%A=S+%F=AR%O=%RD=0%Q=)U1(R=Y%D

OS:F=N%T=80%IPL=164%UN=0%RIPL=G%RID=G%RIPCK=Z%RUCK=G%RUD=G)IE(R=Y%DFI=N%T=8

OS:0%CD=Z)

Network Distance: 0 hops

OS detection performed. Please report any incorrect results at https://nmap.org/submit/ .

Nmap done: 1 IP address (1 host up) scanned in 21.94 seconds Microsoft Windows [Version 10.0.26100.3194]

(c) Microsoft Corporation. All rights reserved.

C:\Users\saurabhs>nmap -O scanme.nmap.org

Starting Nmap 7.95 (https://nmap.org) at 2025-02-26 12:51 India Standard Time

Nmap scan report for scanme.nmap.org (45.33.32.156)

Host is up (0.27s latency).

Not shown: 995 closed tcp ports (reset)

PORT STATE SERVICE

22/tcp open ssh

25/tcp filtered smtp

80/tcp open http

9929/tcp open nping-echo

31337/tcp open Elite

Device type: general purpose|router

Running: Linux 5.X, MikroTik RouterOS 7.X

OS CPE: cpe:/o:linux:linux_kernel:5 cpe:/o:mikrotik:routeros:7 cpe:/o:linux:linux_kernel:5.6.3

OS details: Linux 5.0 - 5.14, MikroTik RouterOS 7.2 - 7.5 (Linux 5.6.3)

Network Distance: 19 hops

OS detection performed. Please report any incorrect results at https://nmap.org/submit/ .

Nmap done: 1 IP address (1 host up) scanned in 25.77 seconds

Microsoft Windows [Version 10.0.26100.3194]

(c) Microsoft Corporation. All rights reserved.

Analyze TTL (Time-To-Live) Values

C:\Windows\System32>ping -c 1 192.168.0.104

Pinging 192.168.0.104 with 32 bytes of data:

Reply from 192.168.0.104: bytes=32 time<1ms TTL=128

Reply from 192.168.0.104: bytes=32 time<1ms TTL=128

Reply from 192.168.0.104: bytes=32 time<1ms TTL=128

Reply from 192.168.0.104: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.0.104:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 0ms, Average = 0ms

#Check Open Ports & Services (-sV)

C:\Users\saurabhs>nmap -sV 192.168.0.104

Starting Nmap 7.95 (https://nmap.org) at 2025-02-26 11:50 India Standard Time

Nmap scan report for 192.168.0.104

Host is up (0.00075s latency).

Not shown: 996 closed tcp ports (reset)

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?

7070/tcp open ssl/realserver?

Service Info: OS: Windows; CPE: cpe:/o:microsoft:windows

Service detection performed. Please report any incorrect results at https://nmap.org/submit/ .

Nmap done: 1 IP address (1 host up) scanned in 25.15 seconds

C:\Users\ravis>wmic OS get OSArchitecture

OSArchitecture

64-bit

C:\Users\saurabhs>echo %PROCESSOR_ARCHITECTURE%

AMD64

#Check SMB for Windows OS

C:\Users\saurabhs>nmap --script smb-os-discovery -p 445 192.168.0.104

Starting Nmap 7.95 (https://nmap.org) at 2025-02-26 11:53 India Standard Time

Nmap scan report for 192.168.0.104

Host is up (0.0010s latency).

PORT STATE SERVICE

445/tcp open microsoft-ds

Nmap done: 1 IP address (1 host up) scanned in 9.83 seconds

#Aggressive Scan (Detailed information about the target)

C:\Users\saurabhs>nmap -A 192.168.0.104

Starting Nmap 7.95 (https://nmap.org) at 2025-02-26 11:59 India Standard Time

Nmap scan report for 192.168.0.104

Host is up (0.00042s latency).

Not shown: 996 closed tcp ports (reset)

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?

7070/tcp open ssl/realserver?

|_ssl-date: TLS randomness does not represent time

| ssl-cert: Subject: commonName=AnyDesk Client

| Not valid before: 2025-02-24T13:30:42

|_Not valid after: 2075-02-12T13:30:42

TCP/IP fingerprint:

OS:SCAN(V=7.95%E=4%D=2/26%OT=135%CT=1%CU=30780%PV=Y%DS=0%DC=L%G=Y%TM=67BEB5

OS:06%P=i686-pc-windows-windows)SEQ(SP=100%GCD=1%ISR=10D%TI=I%CI=I%II=I%SS=

OS:S%TS=A)SEQ(SP=101%GCD=1%ISR=106%TI=I%CI=I%II=I%SS=S%TS=A)SEQ(SP=104%GCD=

OS:1%ISR=10D%TI=I%CI=I%II=I%SS=S%TS=A)SEQ(SP=105%GCD=1%ISR=109%TI=I%CI=I%II

OS:=I%SS=S%TS=A)SEQ(SP=107%GCD=1%ISR=10A%TI=I%CI=I%II=I%SS=S%TS=A)OPS(O1=MF

OS:FD7NW8ST11%O2=MFFD7NW8ST11%O3=MFFD7NW8NNT11%O4=MFFD7NW8ST11%O5=MFFD7NW
8S

OS:T11%O6=MFFD7ST11)WIN(W1=FFFF%W2=FFFF%W3=FFFF%W4=FFFF%W5=FFFF%W6=FFFF)ECN

OS:(R=Y%DF=Y%T=80%W=FFFF%O=MFFD7NW8NNS%CC=N%Q=)T1(R=Y%DF=Y%T=80%S=O%A=S+%F=

OS:AS%RD=0%Q=)T2(R=Y%DF=Y%T=80%W=0%S=Z%A=S%F=AR%O=%RD=0%Q=)T3(R=Y%DF=Y%T=80

OS:%W=0%S=Z%A=O%F=AR%O=%RD=0%Q=)T4(R=Y%DF=Y%T=80%W=0%S=A%A=O%F=R%O=%RD=0%Q
=

OS:)T5(R=Y%DF=Y%T=80%W=0%S=Z%A=S+%F=AR%O=%RD=0%Q=)T6(R=Y%DF=Y%T=80%W=0%S=A%

OS:A=O%F=R%O=%RD=0%Q=)T7(R=Y%DF=Y%T=80%W=0%S=Z%A=S+%F=AR%O=%RD=0%Q=)U1(R=Y%

OS:DF=N%T=80%IPL=164%UN=0%RIPL=G%RID=G%RIPCK=Z%RUCK=G%RUD=G)IE(R=Y%DFI=N%T=

OS:80%CD=Z)

Network Distance: 0 hops

Service Info: OS: Windows; CPE: cpe:/o:microsoft:windows

Host script results:

| smb2-time:

| date: 2025-02-26T06:30:17

|_ start_date: N/A

| smb2-security-mode:

| 3:1:1:

|_ Message signing enabled but not required

OS and Service detection performed. Please report any incorrect results at https://nmap.org/submit/ .

Nmap done: 1 IP address (1 host up) scanned in 47.64 seconds

C:\Users\saurabhs>nmap -A 127.0.0.1 -oN nmap_results.txt

Starting Nmap 7.95 (https://nmap.org) at 2025-02-26 12:01 India Standard Time

Nmap scan report for localhost (127.0.0.1)

Host is up (0.00043s latency).

Not shown: 997 closed tcp ports (reset)

PORT STATE SERVICE VERSION

135/tcp open msrpc Microsoft Windows RPC

445/tcp open microsoft-ds?

7070/tcp open ssl/realserver?

| ssl-cert: Subject: commonName=AnyDesk Client

| Not valid before: 2025-02-24T13:30:42

|_Not valid after: 2075-02-12T13:30:42

|_ssl-date: TLS randomness does not represent time

TCP/IP fingerprint:

OS:SCAN(V=7.95%E=4%D=2/26%OT=135%CT=1%CU=34519%PV=N%DS=0%DC=L%G=Y%TM=67BEB5

OS:75%P=i686-pc-windows-windows)SEQ(SP=102%GCD=1%ISR=106%TI=I%CI=I%II=I%SS=

OS:S%TS=A)SEQ(SP=104%GCD=1%ISR=109%TI=I%CI=I%II=I%SS=S%TS=A)SEQ(SP=104%GCD=

OS:3%ISR=10A%TI=I%CI=I%II=I%SS=S%TS=A)SEQ(SP=105%GCD=1%ISR=10A%TI=I%CI=I%II

OS:=I%SS=S%TS=A)OPS(O1=MFFD7NW8ST11%O2=MFFD7NW8ST11%O3=MFFD7NW8NNT11%O4=MFF

OS:D7NW8ST11%O5=MFFD7NW8ST11%O6=MFFD7ST11)WIN(W1=FFFF%W2=FFFF%W3=FFFF%W4=FF

OS:FF%W5=FFFF%W6=FFFF)ECN(R=Y%DF=Y%T=80%W=FFFF%O=MFFD7NW8NNS%CC=N%Q=)T1(R=Y

OS:%DF=Y%T=80%S=O%A=S+%F=AS%RD=0%Q=)T2(R=Y%DF=Y%T=80%W=0%S=Z%A=S%F=AR%O=%RD

OS:=0%Q=)T3(R=Y%DF=Y%T=80%W=0%S=Z%A=O%F=AR%O=%RD=0%Q=)T4(R=Y%DF=Y%T=80%W=0%

OS:S=A%A=O%F=R%O=%RD=0%Q=)T5(R=Y%DF=Y%T=80%W=0%S=Z%A=S+%F=AR%O=%RD=0%Q=)T6(

OS:R=Y%DF=Y%T=80%W=0%S=A%A=O%F=R%O=%RD=0%Q=)T7(R=Y%DF=Y%T=80%W=0%S=Z%A=S+%F

OS:=AR%O=%RD=0%Q=)U1(R=Y%DF=N%T=80%IPL=164%UN=0%RIPL=G%RID=G%RIPCK=Z%RUCK=G

OS:%RUD=G)IE(R=Y%DFI=N%T=80%CD=Z)

Network Distance: 0 hops

Service Info: OS: Windows; CPE: cpe:/o:microsoft:windows

Host script results:

| smb2-security-mode:

| 3:1:1:

|_ Message signing enabled but not required

| smb2-time:

| date: 2025-02-26T06:32:08

|_ start_date: N/A

OS and Service detection performed. Please report any incorrect results at https://nmap.org/submit/ .

Nmap done: 1 IP address (1 host up) scanned in 45.11 seconds

C:\Users\saurabhs>

Experiment No. 5

Md5 Sha1 Performance :

```
import hashlib
import time
import random
import string
from tabulate import tabulate
def generate_random_message(size):
return ''.join(random.choices(string.ascii_letters + string.digits, k=size)).encode()
def hash_message(algorithm, message):
start_time = time.perf_counter()
hash_obj = hashlib.new(algorithm)
hash_obj.update(message)
digest = hash_obj.hexdigest()
end_time = time.perf_counter()
return digest, (end_time - start_time) * 1e6 # Convert to microseconds
def main():
sizes = [10, 100, 1000, 10000, 50000] # Different message sizes
results = []
for size in sizes:
message = generate_random_message(size)
md5_digest, md5_time = hash_message('md5', message)
sha1_digest, sha1_time = hash_message('sha1', message)
results.append([size, md5_time, sha1_time])
print("\nPerformance Analysis of MD5 vs SHA-1:")
print(tabulate(results, headers=["Message Size (Bytes)", "MD5 Time (µs)", "SHA-1 Time (µs)"],
tablefmt="grid"))
```

if __name__ == "__main__":

main()

output:-

```
PS C:\Users\ravis> pip install tabulate
Collecting tabulate
  Downloading tabulate-0.9.0-py3-none-any.whl.metadata (34 kB)
Downloading tabulate-0.9.0-py3-none-any.whl (35 kB)
Installing collected packages: tabulate
Successfully installed tabulate-0.9.0
PS C:\Users\ravis> & C:/Users/ravis/AppData/Local/Programs/Python/Python313/python.exe c:/Users/ravis/css4.py

Performance Analysis of MD5 vs SHA-1:
+-----------------------+-----------------+-------------------+
|   Message Size (Bytes) |   MD5 Time (µs) |   SHA-1 Time (µs) |
+=======================+=================+===================+
|                    10 |           989.3 |              15.5 |
+-----------------------+-----------------+-------------------+
|                   100 |             1.7 |               1.1 |
+-----------------------+-----------------+-------------------+
|                  1000 |             2.3 |               1.4 |
+-----------------------+-----------------+-------------------+
|                 10000 |            13.1 |               5.2 |
+-----------------------+-----------------+-------------------+
|                 50000 |            60.6 |              22.8 |
+-----------------------+-----------------+-------------------+
PS C:\Users\ravis>
```

Experiment No.6

 # Exploring Wireless Security Tools like Kismet, NetStumbler, Aircrack-ng, and Wireshark

AIM:

To explore and analyze wireless security tools like Kismet, NetStumbler, Aircrack-ng, and Wireshark to understand their functionalities, applications, and significance in securing wireless networks.

THEORY:

Introduction to Wireless Security

Wireless security is a crucial aspect of cybersecurity that focuses on protecting wireless networks from unauthorized access, data interception, and cyber threats. Various tools are available for analyzing, monitoring, and securing wireless networks, helping cybersecurity professionals identify vulnerabilities and implement protective measures.

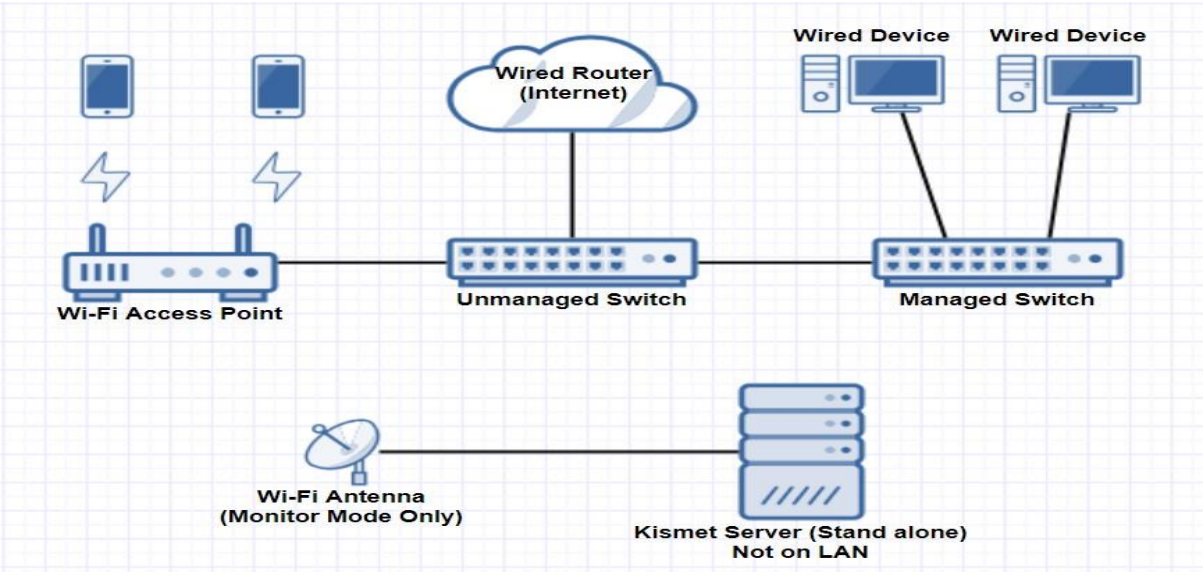
Wireless Security Tools

1. Kismet

- Overview: Kismet is a network detector, packet sniffer, and intrusion detection system for wireless networks.
- Features:
    - Supports multiple wireless network types (Wi-Fi, Bluetooth, etc.).
    - Works in passive mode to detect hidden SSIDs.
    - Provides real-time packet capture and analysis.
- Installation:
    - On Linux: sudo apt update

      sudo apt install kismet
    - On macOS: brew install kismet
- Usage Commands:
    - Start Kismet: sudo kismet

Image:



architecture.

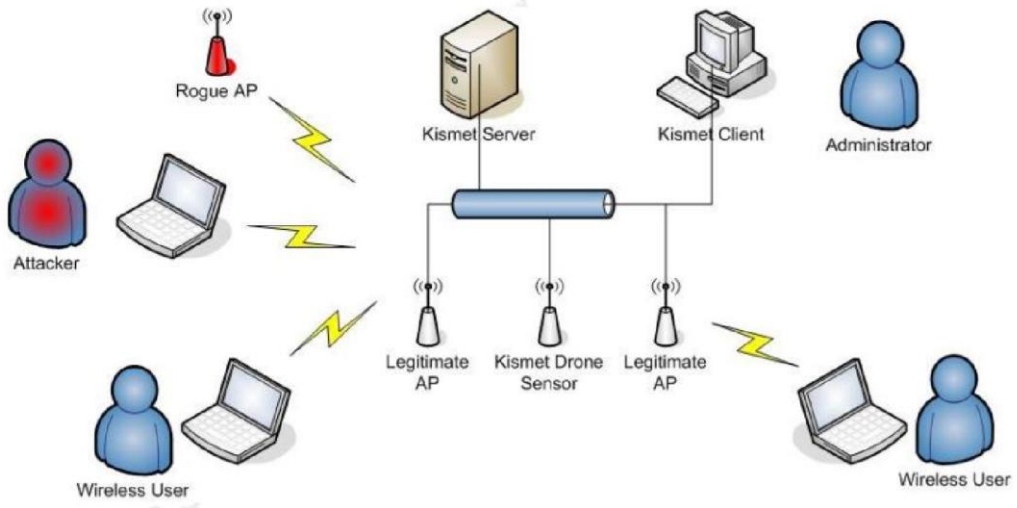


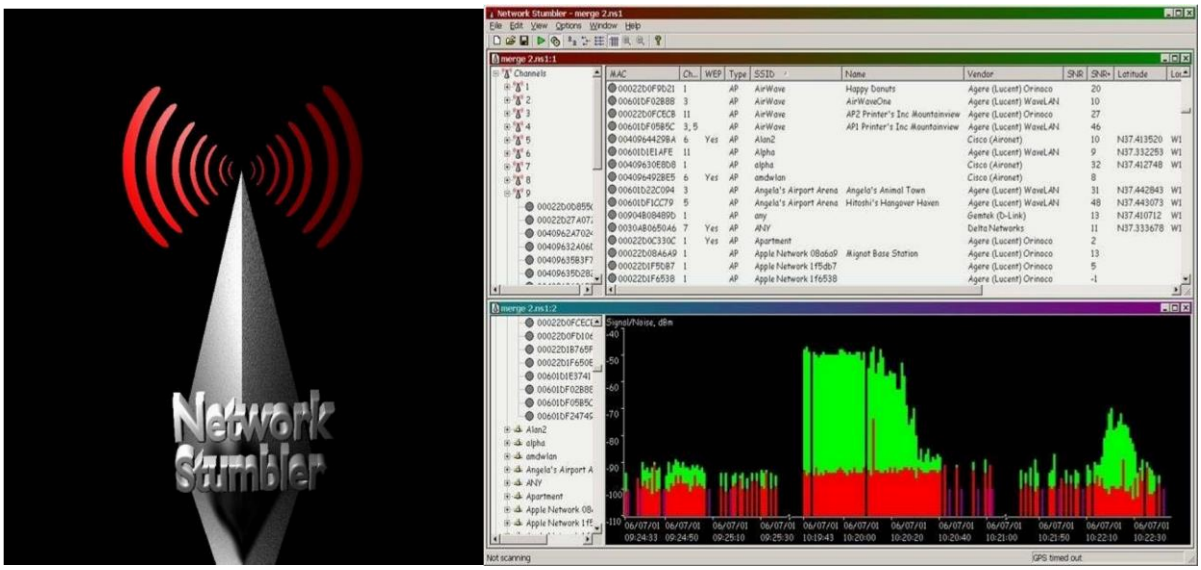
Figure 1 - OpenWRT Kismet IDS Architecture

2. NetStumbler

- Overview: NetStumbler is a Windows-based tool used to detect Wi-Fi networks and analyze signal strength.
- Features:
    - Identifies available Wi-Fi networks and their details (SSID, encryption type, etc.).

- Helps in wardriving and optimizing Wi-Fi signal placement. ○ Supports GPS mapping for network tracking.
- Installation: ○ Download from NetStumbler's official website.
- Usage:
  - Open the application and scan for networks.

Image:



3. Aircrack-ng

- Overview: Aircrack-ng is a suite of tools used for auditing wireless network security.
- Features:
  - Captures network packets and analyzes them. ○ Supports WEP and WPA/WPA2-PSK cracking.
  - Includes tools for packet injection and deauthentication attacks.
- Installation:
  - On Linux:

    sudo apt update

    sudo apt install aircrack-ng
  - On macOS:

    brew install aircrack-ng
- Usage Commands:

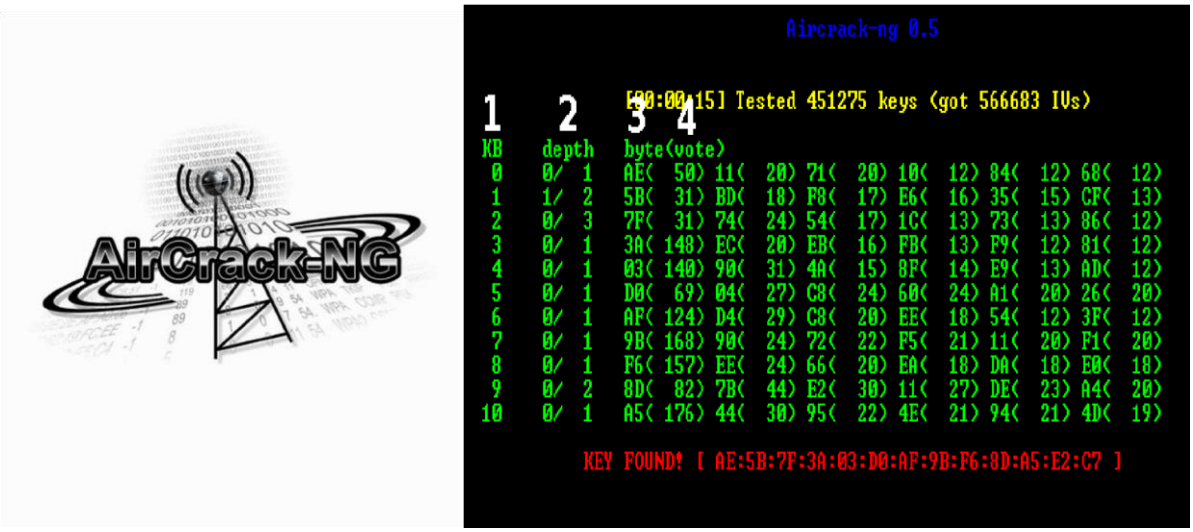
- Monitor mode activation:

  sudo airmon-ng start wlan0

- Start packet capture:

  sudo airodump-ng wlan0mon

Image:



4. Wireshark

- Overview: Wireshark is a powerful packet analysis tool used to inspect network traffic in real-time. • Features:
  - Supports deep packet inspection for troubleshooting and security analysis.
  - Filters and categorizes network traffic.
  - Identifies security threats and anomalies.
- Installation:
  - On Linux:

    sudo apt update

    sudo apt install wireshark

  - On macOS:

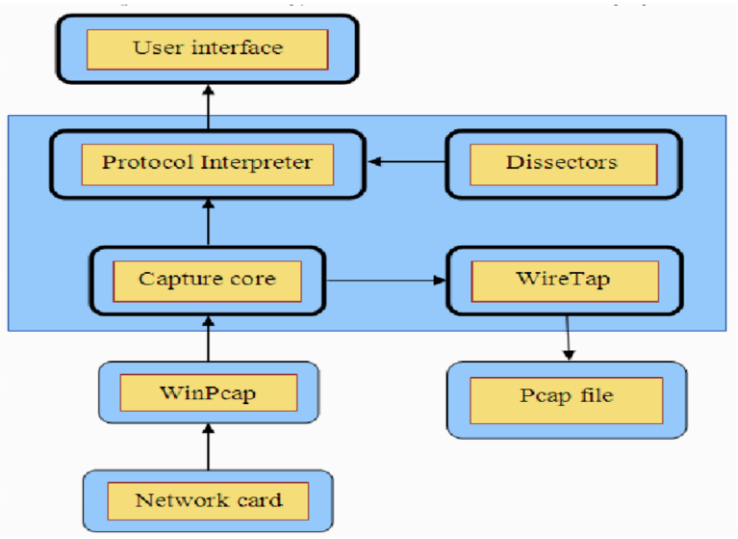
    brew install --cask wireshark

  - On Windows:
    - ✦ Download the installer from Wireshark's official website.

- Usage Commands:
    - Start Wireshark from the terminal:

      wireshark

Image:



CONCLUSION

Wireless security tools like Kismet, NetStumbler, Aircrack-ng, and Wireshark play a crucial role in identifying vulnerabilities, analyzing network traffic, and ensuring the security of wireless networks. These tools help security professionals monitor, troubleshoot, and protect against potential cyber threats. By understanding and utilizing these tools, organizations can enhance their wireless security posture and prevent unauthorized access or attacks on their networks.

Experiment No.7

AIM:

Study the use of network reconnaissance tools like WHOIS, dig, traceroute, and nslookup to gather information about networks and domain registrars.

THEORY:

Network reconnaissance is a crucial phase in ethical hacking and cybersecurity analysis. It involves gathering information about target networks, domains, and their associated entities. Various tools such as WHOIS, dig, traceroute, and nslookup are used for this purpose. These tools help identify domain ownership, DNS records, IP addresses, and network topology.

1. WHOIS

WHOIS is a query and response protocol used to obtain registration details of a domain. It provides information such as domain owner, contact details, registrar, and expiry date.

Usage: 1.Linux Command: whois example.com

2.Windows: Use online WHOIS lookup services or install a WHOIS client.

Example Output:

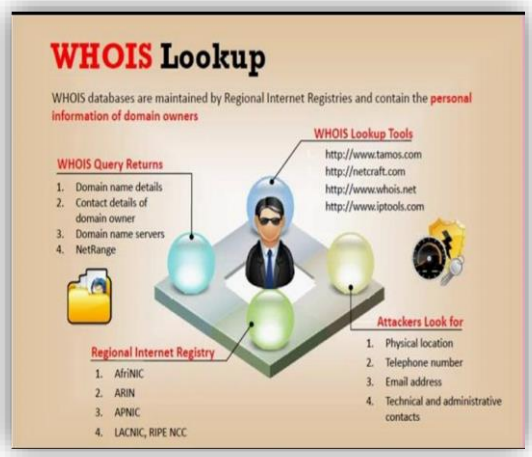
Domain Name: example.com

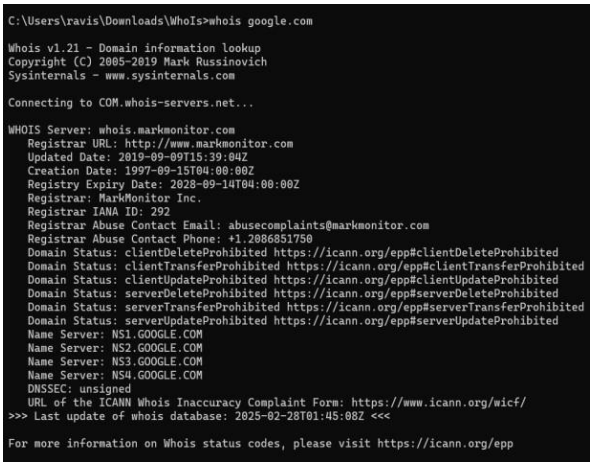
Registrar: Example Registrar Inc.

Creation Date: 1995-08-14

Expiration Date: 2025-08-14

Image:





```
C:\Users\ravis\Downloads\WhoIs>whois google.com

Whois v1.21 - Domain information lookup
Copyright (C) 2005-2019 Mark Russinovich
Sysinternals - www.sysinternals.com

Connecting to COM.whois-servers.net...

WHOIS Server: whois.markmonitor.com
   Registrar URL: http://www.markmonitor.com
   Updated Date: 2019-09-09T15:39:04Z
   Creation Date: 1997-09-15T04:00:00Z
   Registry Expiry Date: 2028-09-14T04:00:00Z
   Registrar: MarkMonitor Inc.
   Registrar IANA ID: 292
   Registrar Abuse Contact Email: abusecomplaints@markmonitor.com
   Registrar Abuse Contact Phone: +1.2086851750
   Domain Status: clientDeleteProhibited https://icann.org/epp#clientDeleteProhibited
   Domain Status: clientTransferProhibited https://icann.org/epp#clientTransferProhibited
   Domain Status: clientUpdateProhibited https://icann.org/epp#clientUpdateProhibited
   Domain Status: serverDeleteProhibited https://icann.org/epp#serverDeleteProhibited
   Domain Status: serverTransferProhibited https://icann.org/epp#serverTransferProhibited
   Domain Status: serverUpdateProhibited https://icann.org/epp#serverUpdateProhibited
   Name Server: NS1.GOOGLE.COM
   Name Server: NS2.GOOGLE.COM
   Name Server: NS3.GOOGLE.COM
   Name Server: NS4.GOOGLE.COM
   DNSSEC: unsigned
   URL of the ICANN Whois Inaccuracy Complaint Form: https://www.icann.org/wicf/
>>> Last update of whois database: 2025-02-28T01:45:08Z <<<

For more information on Whois status codes, please visit https://icann.org/epp
```

Name Servers: ns1.example.com, ns2.example.com

2. DIG (Domain Information Groper)

Dig is a command-line tool used for querying DNS records. It helps retrieve information about domain name system (DNS) records, including A records, MX records, and NS records.

Usage:

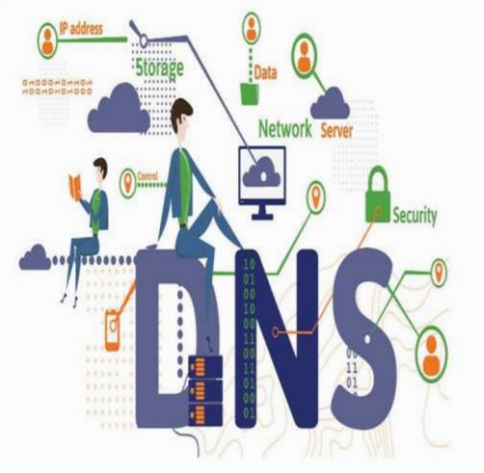
- Basic Query: dig example.com
- Query MX Records: dig example.com MX

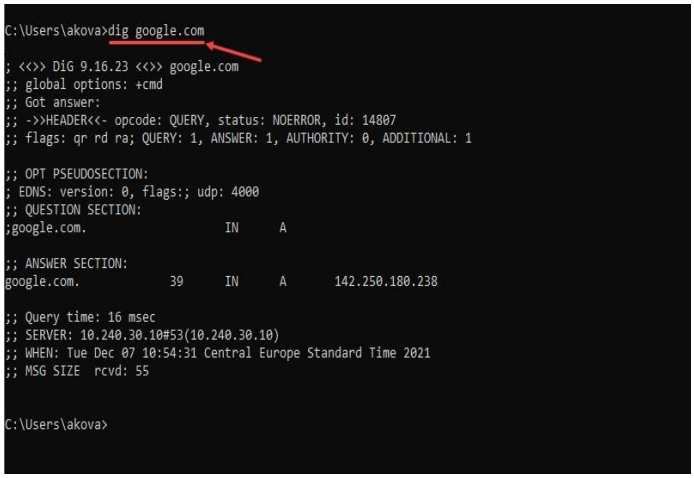
Example Output: ;; ANSWER

SECTION: example.com. 299 IN A

192.0.2.1

Image:





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3. TRACEROUTE

Traceroute is a diagnostic tool that tracks the path packets take to reach a target host. It helps analyze network latency and pinpoint network bottlenecks.

Usage:

- Linux/macOS: traceroute example.com

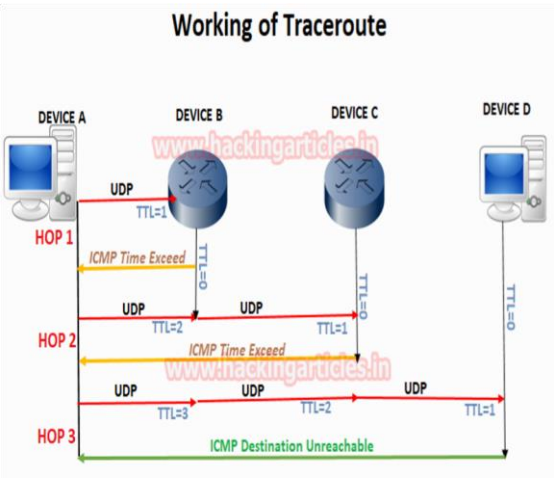
- Windows: tracert example.com

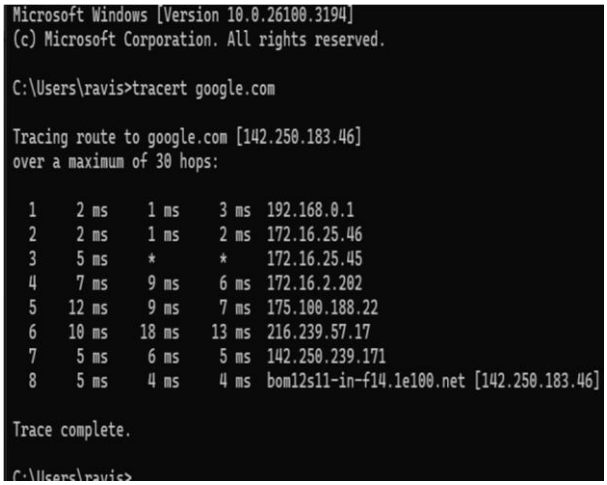
Example Output:

Tracing route to example.com [192.0.2.1] over a maximum of 30 hops:

1 192.168.1.1 (1 ms)
2 203.0.113.5 (10 ms)
3 192.0.2.1 (20 ms)

Image:





---

4. NSLOOKUP (Name Server Lookup)

Nslookup is used to query DNS servers to obtain domain name or IP address mapping details.

Usage:

- Interactive Mode: nslookup
- Specific Query: nslookup example.com

Example Output:

Server: dns.example.com

Address: 203.0.113.2

Non-authoritative answer:

Name: example.com

Address: 192.0.2.1

Image:

CONCLUSION:

Network reconnaissance tools such as WHOIS, dig, traceroute, and nslookup provide valuable insights into domain registrations, DNS records, and network infrastructure. These tools are essential for cybersecurity professionals to analyze networks, diagnose connectivity issues, and enhance security posture. Understanding their functionality helps in identifying vulnerabilities and securing networks against potential threats.

This document comprehensively covers the theoretical background, usage, and examples of network reconnaissance tools. It is structured to ensure clarity and effectiveness in learning and practical application.

Experiment No. 9

#ARP spoofing with nmap:

Microsoft Windows [Version 10.0.26100.3194]

(c) Microsoft Corporation. All rights reserved.

C:\Users\ravis>nmap --version

Nmap version 7.95 (https://nmap.org)

Platform: i686-pc-windows-windows

Compiled with: nmap-liblua-5.4.6 openssl-3.0.13 nmap-libssh2-1.11.0 nmap-libz-1.3.1

nmaplibpcre210.43 Npcap-1.79 nmap-libdnet-1.12 ipv6 Compiled without:

Available nsock engines: iocp poll select

C:\Users\ravis>ipconfig

Windows IP Configuration

Wireless LAN adapter Local Area Connection* 1:

Media State . . . . . : Media disconnected Connection-specific

DNS Suffix . :

Wireless LAN adapter Local Area Connection* 2:

Media State . . . . . : Media disconnected

Connection-specific DNS Suffix . :

Wireless LAN adapter Wi-Fi:

Connection-specific DNS Suffix . :

Link-local IPv6 Address . . . . . : fe80::1788:907a:98b4:85bf%6

IPv4 Address. . . . . : 192.168.0.104 Subnet Mask . . . . . : 255.255.255.0 Default Gateway . . . . . : 192.168.0.1

Ethernet adapter Ethernet:

Media State . . . . . : Media disconnected

Connection-specific DNS Suffix . :

#ARP spoofing

C:\Windows\System32>nmap -sn 192.168.0.0/24

Starting Nmap 7.95 (https://nmap.org) at 2025-03-01 14:06 India Standard Time

Nmap scan report for 192.168.0.1

Host is up (0.0083s latency).

MAC Address: E8:48:B8:58:AE:18 (TP-Link Limited)

Nmap scan report for 192.168.0.100

Host is up (0.0086s latency).

MAC Address: EC:C8:9C:91:DE:A7 (Hangzhou Hikvision Digital Technology)

Nmap scan report for 192.168.0.104

Host is up.

Nmap done: 256 IP addresses (3 hosts up) scanned in 13.11 seconds

#ARP spoofing command

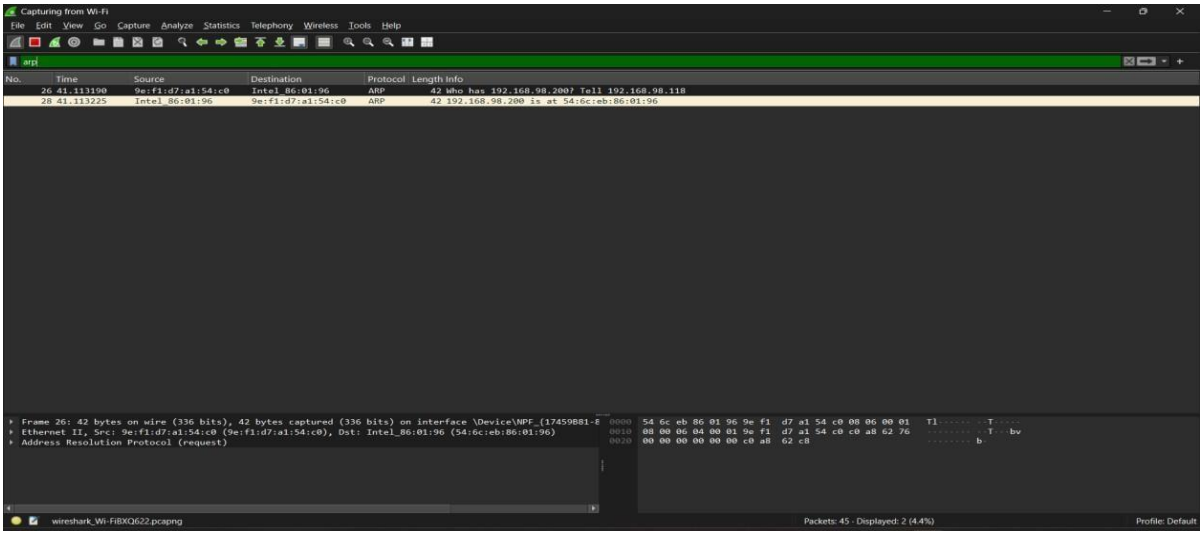
C:\Users\ravis>arp -a

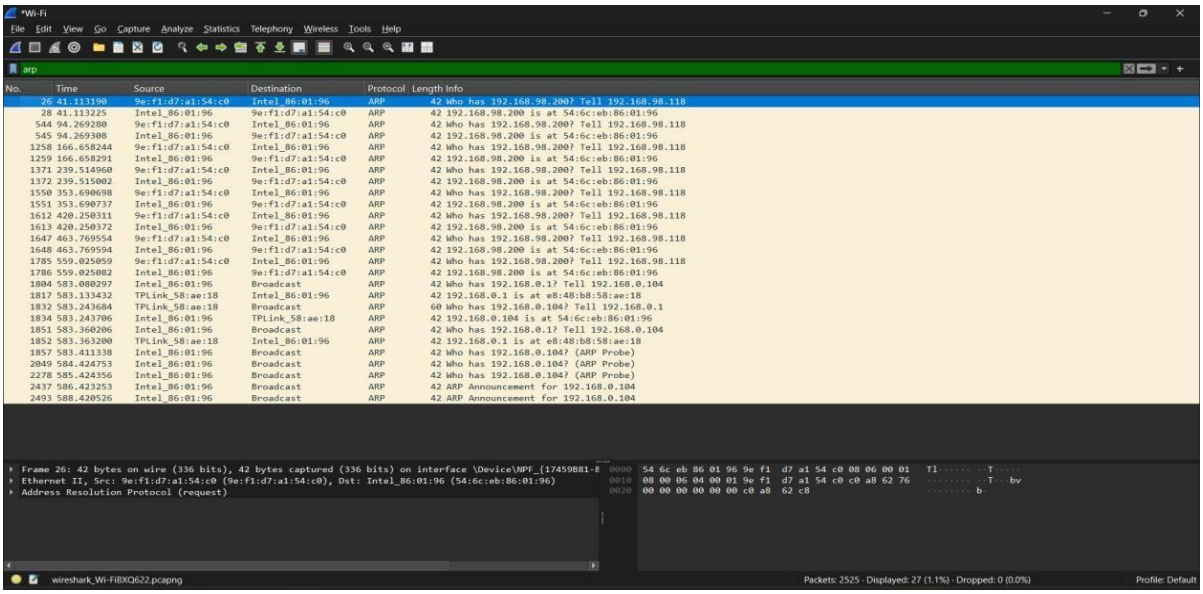
Interface: 192.168.0.104 --- 0x6

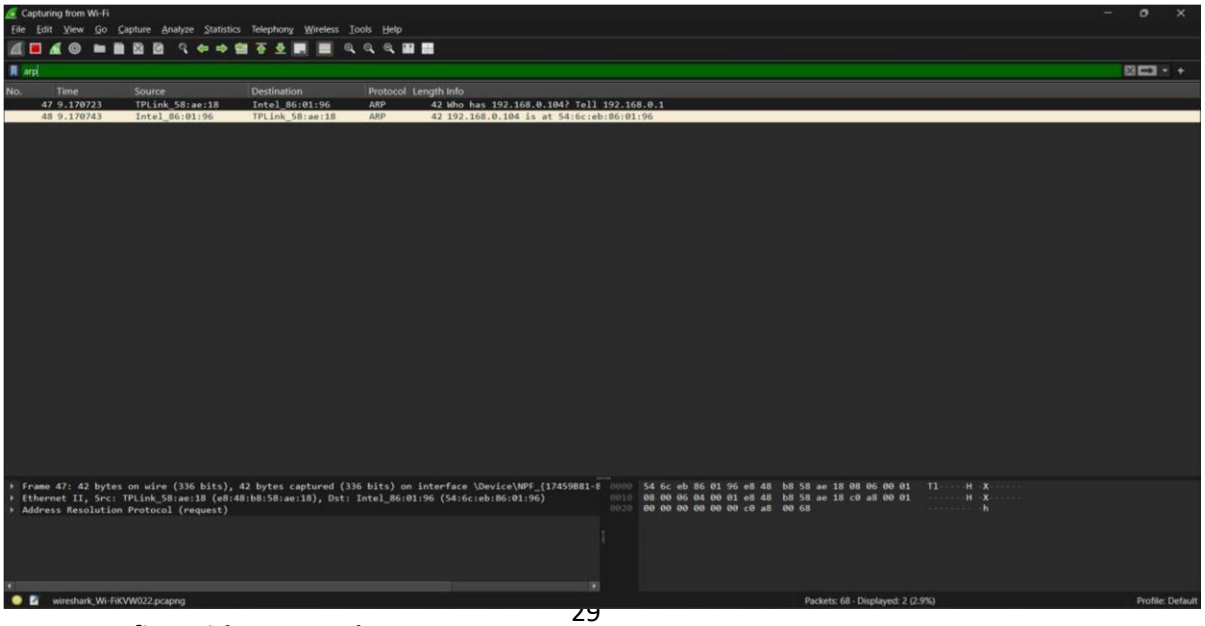
Internet Address	Physical Address	Type
192.168.0.1	**e8-48-b8-58-ae-18**	**dynamic**
192.168.0.255	ff-ff-ff-ff-ff-ff	static
224.0.0.22	01-00-5e-00-00-16	static
224.0.0.251	01-00-5e-00-00-fb	static
224.0.0.252	01-00-5e-00-00-fc	static
239.255.102.18	01-00-5e-7f-66-12	static
239.255.255.250	01-00-5e-7f-ff-fa	static
255.255.255.255	ff-ff-ff-ff-ff-ff	static

- Our current output does **not** show any duplicate IPs with different MAC addresses, so **no ARP spoofing is detected at the moment**.

#ARP spoofing with WireShark:







#ARP spoofing with ARPwatch

1]To start linux in windows:

Windows PowerShell

Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\WINDOWS\system32> wsl --install >> wsl --install

Installing: Ubuntu Ubuntu has been installed.

Launching Ubuntu...

Installing, this may take a few minutes...

dfcePlease create a default UNIX user account. The username does not need to match your Windows username.

For more information visit: https://aka.ms/wslusers

Enter new UNIX username: ravi

New password: Retype new password:

passwd: password updated successfully

Installation successful!

To run a command as administrator (user "root"), use "sudo <command>".

See "man sudo_root" for details.

Welcome to Ubuntu 24.04.1 LTS (GNU/Linux 5.15.167.4-microsoft-standard-WSL2 x86_64)

* Documentation: https://help.ubuntu.com

* Management: https://landscape.canonical.com

* Support: https://ubuntu.com/pro

System information as of Sat Mar 1 05:51:53 UTC 2025

System load: 0.0 Processes: 58

Usage of /: 0.1% of 1006.85GB Users logged in: 0

Memory usage: 12% IPv4 address for eth0: 172.20.43.133 Swap usage: 0%

This message is shown once a day. To disable it please create the /home/ravi/.hushlogin file.

ravi@Ravi:~$

2]Checking ARP spoofing through Linux:

Microsoft Windows [Version 10.0.26100.3194]

(c) Microsoft Corporation. All rights reserved.

#Windows Subsystem for Linux

C:\Users\ravis>wsl

To run a command as administrator (user "root"), use "sudo <command>".

See "man sudo_root" for details.

#ARPwatch installation ravi@Ravi:/mnt/c/Users/ravis$ sudo apt update && sudo apt install arpwatch

[sudo] password for ravi:

Hit:1 http://archive.ubuntu.com/ubuntu noble InRelease

Get:2 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]

Get:3 http://archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]

Get:4 http://security.ubuntu.com/ubuntu noble-security/main amd64 Packages [641 kB]

Get:5 http://archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]

Get:6 http://archive.ubuntu.com/ubuntu noble/universe amd64 Packages [15.0 MB]

Get:7 http://security.ubuntu.com/ubuntu noble-security/main Translation-en [122 kB]

Get:8 http://security.ubuntu.com/ubuntu noble-security/main amd64 Components [9012 B]

Get:9 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Packages [815 kB]

Get:10 http://security.ubuntu.com/ubuntu noble-security/universe Translation-en [174 kB]

Get:11 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Components [51.9 kB]

Get:12 http://security.ubuntu.com/ubuntu noble-security/universe amd64 c-n-f Metadata [13.5 kB]

Get:13 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Packages [667 kB]

Get:14 http://security.ubuntu.com/ubuntu noble-security/restricted Translation-en [131 kB]

Get:15 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Components [212 B]

Get:16 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Packages [19.4 kB]

Get:17 http://security.ubuntu.com/ubuntu noble-security/multiverse Translation-en [4308 B]

Get:18 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [208 B]
Get:19 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 c-n-f Metadata [356 B]
Get:20 http://archive.ubuntu.com/ubuntu noble/universe Translation-en [5982 kB]
Get:21 http://archive.ubuntu.com/ubuntu noble/universe amd64 Components [3871 kB]
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Get:26 http://archive.ubuntu.com/ubuntu noble/multiverse amd64 c-n-f Metadata [8328 B]
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Get:29 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [151 kB]
Get:30 http://archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [1029 kB]
Get:31 http://archive.ubuntu.com/ubuntu noble-updates/universe Translation-en [257 kB]
Get:32 http://archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [364 kB]
Get:33 http://archive.ubuntu.com/ubuntu noble-updates/universe amd64 c-n-f Metadata [19.9 kB]
Get:34 http://archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Packages [695 kB]
Get:35 http://archive.ubuntu.com/ubuntu noble-updates/restricted Translation-en [138 kB]
Get:36 http://archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 B]
Get:37 http://archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Packages [23.4 kB]
Get:38 http://archive.ubuntu.com/ubuntu noble-updates/multiverse Translation-en [5308 B]
Get:39 http://archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [940 B]
Get:40 http://archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 c-n-f Metadata [552 B]
Get:41 http://archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [208 B]
Get:42 http://archive.ubuntu.com/ubuntu noble-backports/main amd64 c-n-f Metadata [112 B]
Get:43 http://archive.ubuntu.com/ubuntu noble-backports/universe amd64 Packages [14.2 kB]
Get:44 http://archive.ubuntu.com/ubuntu noble-backports/universe Translation-en [12.1 kB]
Get:45 http://archive.ubuntu.com/ubuntu noble-backports/universe amd64 Components [20.0 kB]
Get:46 http://archive.ubuntu.com/ubuntu noble-backports/universe amd64 c-n-f Metadata [1104 B]
Get:47 http://archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [212 B]
Get:48 http://archive.ubuntu.com/ubuntu noble-backports/restricted amd64 c-n-f Metadata [116 B]
Get:49 http://archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 B]

Get:50 http://archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 c-n-f Metadata [116 B]

Fetched 32.5 MB in 8s (3876 kB/s)

Reading package lists... Done

Building dependency tree... Done

Reading state information... Done

125 packages can be upgraded. Run 'apt list --upgradable' to see them.

Reading package lists... Done

Building dependency tree... Done

Reading state information... Done

The following additional packages will be installed: ibverbs-providers ieee-data libibverbs1 libnl-3-200 libnl-route-3-200 libpcap0.8t64

The following NEW packages will be installed: arpwatch ibverbs-providers ieee-data libibverbs1 libnl-3-200 libnl-route-3-200 libpcap0.8t64

0 upgraded, 7 newly installed, 0 to remove and 125 not upgraded.

Need to get 2993 kB of archives.

After this operation, 16.5 MB of additional disk space will be used.

Do you want to continue? [Y/n] y

Get:1 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 libnl-3-200 amd64 3.7.00.3build1.1 [55.7 kB]

Get:2 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 libnl-route-3-200 amd64 3.7.00.3build1.1 [189 kB]

Get:3 http://archive.ubuntu.com/ubuntu noble/main amd64 libibverbs1 amd64 50.0-2build2 [67.8 kB]

Get:4 http://archive.ubuntu.com/ubuntu noble/main amd64 libpcap0.8t64 amd64 1.10.44.1ubuntu3 [151 kB]

Get:5 http://archive.ubuntu.com/ubuntu noble/universe amd64 arpwatch amd64 2.1a15-8.1build2 [42.5 kB]

Get:6 http://archive.ubuntu.com/ubuntu noble/main amd64 ibverbs-providers amd64 50.0-2build2 [374 kB]

Get:7 http://archive.ubuntu.com/ubuntu noble/main amd64 ieee-data all 20220827.1 [2113 kB]

Fetched 2993 kB in 2s (1624 kB/s)

Selecting previously unselected package libnl-3-200:amd64.

(Reading database ... 40794 files and directories currently installed.) Preparing to unpack .../0-libnl-3-200_3.7.0-0.3build1.1_amd64.deb ...

Unpacking libnl-3-200:amd64 (3.7.0-0.3build1.1) ...

Selecting previously unselected package libnl-route-3-200:amd64.

Preparing to unpack .../1-libnl-route-3-200_3.7.0-0.3build1.1_amd64.deb ...

Unpacking libnl-route-3-200:amd64 (3.7.0-0.3build1.1) ...

Selecting previously unselected package libibverbs1:amd64.

Preparing to unpack .../2-libibverbs1_50.0-2build2_amd64.deb ...

Unpacking libibverbs1:amd64 (50.0-2build2) ...

Selecting previously unselected package libpcap0.8t64:amd64.

Preparing to unpack .../3-libpcap0.8t64_1.10.4-4.1ubuntu3_amd64.deb ...

Unpacking libpcap0.8t64:amd64 (1.10.4-4.1ubuntu3) ...

Selecting previously unselected package arpwatch.

Preparing to unpack .../4-arpwatch_2.1a15-8.1build2_amd64.deb ...

Unpacking arpwatch (2.1a15-8.1build2) ...

Selecting previously unselected package ibverbs-providers:amd64.

Preparing to unpack .../5-ibverbs-providers_50.0-2build2_amd64.deb ...

Unpacking ibverbs-providers:amd64 (50.0-2build2) ...

Selecting previously unselected package ieee-data.

Preparing to unpack .../6-ieee-data_20220827.1_all.deb ...

Unpacking ieee-data (20220827.1) ...

Setting up ieee-data (20220827.1) ...

Setting up libnl-3-200:amd64 (3.7.0-0.3build1.1) ...

Setting up libnl-route-3-200:amd64 (3.7.0-0.3build1.1) ...

Setting up libibverbs1:amd64 (50.0-2build2) ...

Setting up ibverbs-providers:amd64 (50.0-2build2) ...

Setting up libpcap0.8t64:amd64 (1.10.4-4.1ubuntu3) ...

Setting up arpwatch (2.1a15-8.1build2) ...

Created symlink /etc/systemd/system/multi-user.target.wants/arpwatch.service → /usr/lib/systemd/system/arpwatch.service.

Processing triggers for man-db (2.12.0-4build2) ...

Processing triggers for libc-bin (2.39-0ubuntu8.3) ...

#ARPwatch new version installing ravi@Ravi:/mnt/c/Users/ravis$ sudo apt update

&& sudo apt install arpwatch -y

Hit:1 http://security.ubuntu.com/ubuntu noble-security InRelease

Hit:2 http://archive.ubuntu.com/ubuntu noble InRelease

Hit:3 http://archive.ubuntu.com/ubuntu noble-updates InRelease

Hit:4 http://archive.ubuntu.com/ubuntu noble-backports InRelease

Reading package lists... Done

Building dependency tree... Done

Reading state information... Done

125 packages can be upgraded. Run 'apt list --upgradable' to see them.

Reading package lists... Done

Building dependency tree... Done Reading state information...

Done **arpwatch is already the newest version (2.1a15-**

8.1build2).

0 upgraded, 0 newly installed, 0 to remove and 125 not upgraded.

#Start arpwatch Service ravi@Ravi:/mnt/c/Users/ravis$ sudo systemctl

start arpwatch

#Enable ARPwatch ravi@Ravi:/mnt/c/Users/ravis$ sudo systemctl

enable arpwatch

Synchronizing state of arpwatch.service with SysV service script with

/usr/lib/systemd/systemdsysvinstall.

Executing: /usr/lib/systemd/systemd-sysv-install enable arpwatch

#Find your interface using:

saurabh@saurabh:/mnt/c/Users/ravis$ ip a

1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000

link/loopback 00:00:00:00:00:00 brd

00:00:00:00:00:00 inet 127.0.0.1/8 scope host lo

valid_lft forever preferred_lft forever inet

10.255.255.254/32 brd 10.255.255.254 scope global lo

valid_lft forever preferred_lft forever inet6 ::1/128 scope host

valid_lft forever preferred_lft forever

2: **eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000**

link/ether 00:15:5d:2b:83:f5 brd ff:ff:ff:ff:ff:ff inet

172.20.43.133/20 brd 172.20.47.255 **scope global eth0**

valid_lft forever preferred_lft forever inet6

fe80::215:5dff:fe2b:83f5/64 scope link valid_lft forever

preferred_lft forever

#Run ARPWATCH on a Specific Interface **ravi@Ravi:/mnt/c/Users/ravis$**

sudo arpwatch -i eth0

#Run ARPWATCH on a Specific Interface ravi@Ravi:/mnt/c/Users/ravis$ sudo

cat /var/log/syslog | grep arpwatch

2025-03-01T06:12:45.848301+00:00 Ravi addgroup[813]: Adding group `arpwatch' (GID 109) ...

2025-03-01T06:12:45.885865+00:00 Ravi adduser[823]: Adding system user `arpwatch' (UID 105) ...

2025-03-01T06:12:45.886906+00:00 Ravi adduser[823]: Adding new user `arpwatch' (UID 105) with group `arpwatch' ...

2025-03-01T06:12:46.473367+00:00 Ravi systemd[1]: Starting arpwatch.service - arpwatch service...

2025-03-01T06:12:46.476165+00:00 Ravi systemd[1]: Finished arpwatch.service - arpwatch service.

2025-03-01T06:20:59.567487+00:00 Ravi arpwatch: listening on eth0

#Run this command to check for actual ARP spoofing alerts: ravi@Ravi:/mnt/c/Users/ravis$ sudo cat /var/log/syslog | grep -i "changed ethernet" ravi@Ravi:/mnt/c/Users/ravis$

note:-

If **no output appears**, it means **no ARP spoofing has been detected**.

If ARP Spoofing is Detected: You

will see logs like:

arpwatch: changed ethernet address 54:xx:xx:xx -> e8:xx:xx:xx for 192.168.X.X

Experiment No.10

#kali linux installation(in powershell)

Windows PowerShell

Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\WINDOWS\system32> wsl --install -d kali-linux

>>

Installing: Kali Linux Rolling Kali Linux

Rolling has been installed.

Launching Kali Linux Rolling...

Installing, this may take a few minutes...

esvPlease create a default UNIX user account. The username does not need to match your Windows username.

For more information visit: https://aka.ms/wslusers

Enter new UNIX username: ravi

New password: Retype

new password:

passwd: password updated successfully

Installation successful!

┌──(Message from Kali developers)

│ This is a minimal installation of Kali Linux, you likely

│ want to install supplementary tools. Learn how:

│ ⇒ https://www.kali.org/docs/troubleshooting/common-minimum-setup/

└──(Run: “touch ~/.hushlogin” to hide this message)

┌──(ravi㉿Ravi)-[~]

└─$

#Update and Upgrade Kali(in bash)

┌──(ravi㉿Ravi)-[~]

└─$ **sudo apt update && sudo apt full-upgrade -y**

#Install Kali Linux Tools (Optional)(in bash)

┌──(ravi㉿Ravi)-[~]

└─$**sudo apt install -y kali-linux-default**

#Enable Systemd (For Running Nessus)(in bash)

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo nano /etc/wsl.conf** #Edit the WSL config file:

>>[sudo] password for ravi:

#Add the following lines: **[boot]**

systemd=true

#Steps to Restart WSL(in powershell as administrator): Windows

PowerShell

Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\WINDOWS\system32> **wsl --shutdown**

PS C:\WINDOWS\system32> **wsl -d kali-linux**

┌──(ravi㉿Ravi)-[/mnt/c/WINDOWS/system32]

└─$

#Verify Kali is Running

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **uname -a**

Linux Ravi 5.15.167.4-microsoft-standard-WSL2 #1 SMP Tue Nov 5 00:21:55 UTC 2024 x86_64 GNU/Linux

#Download Nessus

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **wget https://www.tenable.com/downloads/api/v2/pages/nessus/files/Nessus-10.8.3debian10_amd64.deb**

--2025-03-01 19:48:43-- https://www.tenable.com/downloads/api/v2/pages/nessus/files/Nessus-10.8.3-debian10_amd64.deb

Resolving www.tenable.com (www.tenable.com)... 104.16.49.5, 104.16.48.5, 2606:4700::6810:3105,

Connecting to www.tenable.com (www.tenable.com)|104.16.49.5|:443... connected.

HTTP request sent, awaiting response... 200 OK

Length: unspecified [application/x-debian-package]

Saving to: ‘Nessus-10.8.3-debian10_amd64.deb’

Nessus-10.8.3-debian10_amd64.deb [<=>] 65.66M

4.81MB/s in 14s

2025-03-01 19:48:57 (4.76 MB/s) **- ‘Nessus-10.8.3-debian10_amd64.deb’ saved [68849110]**

#After downloading, install it with

#If any dependency issues arise, fix them using

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo dpkg -i Nessus-10.8.3-debian10_amd64.deb**

sudo apt --fix-broken install

[sudo] password for ravi:

Selecting previously unselected package nessus.

(Reading database ... 311004 files and directories currently installed.)

Preparing to unpack Nessus-10.8.3-debian10_amd64.deb ...

Unpacking nessus (10.8.3) ...

Setting up nessus (10.8.3) ...

HMAC : (Module_Integrity) : Pass
SHA1 : (KAT_Digest) : Pass
SHA2 : (KAT_Digest) : Pass
SHA3 : (KAT_Digest) : Pass
TDES : (KAT_Cipher) : Pass
AES_GCM : (KAT_Cipher) : Pass
AES_ECB_Decrypt : (KAT_Cipher) : Pass
RSA : (KAT_Signature) : RNG : (Continuous_RNG_Test) : Pass
Pass
ECDSA : (PCT_Signature) : Pass
ECDSA : (PCT_Signature) : Pass
DSA : (PCT_Signature) : Pass
TLS13_KDF_EXTRACT : (KAT_KDF) : Pass
TLS13_KDF_EXPAND : (KAT_KDF) : Pass
TLS12_PRF : (KAT_KDF) : Pass
PBKDF2 : (KAT_KDF) : Pass
SSHKDF : (KAT_KDF) : Pass
KBKDF : (KAT_KDF) : Pass
HKDF : (KAT_KDF) : Pass
SSKDF : (KAT_KDF) : Pass
X963KDF : (KAT_KDF) : Pass
X942KDF : (KAT_KDF) : Pass

HASH : (DRBG) : Pass
CTR : (DRBG) : Pass
HMAC : (DRBG) : Pass
DH : (KAT_KA) : Pass
ECDH : (KAT_KA) : Pass
RSA_Encrypt : (KAT_AsymmetricCipher) : Pass
RSA_Decrypt : (KAT_AsymmetricCipher) : Pass RSA_Decrypt :
(KAT_AsymmetricCipher) : Pass
INSTALL PASSED

Unpacking Nessus Scanner Core Components...

- You can start Nessus Scanner by typing /bin/systemctl start nessusd.service

- Then go to https://Ravi:8834/ to configure your scanner

The following packages were automatically installed and are no longer required:

libldap-2.5-0 python3.12 python3.12-minimal

Use 'sudo apt autoremove' to remove them.

Summary:

Upgrading: 0, Installing: 0, Removing: 0, Not Upgrading: 0

#Start the Nessus service

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo systemctl start nessusd.service**

#Enable it to start at boot

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo systemctl enable nessusd**

[sudo] password for ravi:

Created symlink '/etc/systemd/system/multi-user.target.wants/nessusd.service' →

'/usr/lib/systemd/system/nessusd.service'.

#Check if it's running

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo systemctl status nessusd.service**

● **nessusd.service - The Nessus Vulnerability Scanner**

Loaded: loaded (/usr/lib/systemd/system/nessusd.service; enabled; preset: disabled)

Active: active (running) since Sat 2025-03-01 20:01:40 IST; 19min ago

Invocation: 63d5ccaa52954f57859b144b3eeeac61

Main PID: 734 (nessus-service)

Tasks: 16 (limit: 4584)

Memory: 2.8G

CGroup: /system.slice/nessusd.service

├─734 /opt/nessus/sbin/nessus-service -q

└─908 nessusd -q

Mar 01 20:01:40 Ravi systemd[1]: Started nessusd.service - The Nessus Vulnerability Scanner.

Mar 01 20:01:41 Ravi nessus-service[735]: Cached 0 plugin libs in 0msec

Mar 01 20:01:41 Ravi nessus-service[735]: Cached 0 plugin libs in 0msec

Mar 01 20:17:55 Ravi nessus-service[908]: Cached 0 plugin libs in 0msec

Mar 01 20:17:55 Ravi nessus-service[908]: Cached 304 plugin libs in 87msec

#Now, open your browser and go to:

https://localhost:8834/

#get the ip to scan

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **ip a**

1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000 link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00

inet 127.0.0.1/8 scope host lo valid_lft forever preferred_lft forever inet 10.255.255.254/32 brd 10.255.255.254 scope global lo valid_lft forever preferred_lft forever inet6 ::1/128 scope host valid_lft forever preferred_lft forever

2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000

link/ether 00:15:5d:ed:5c:ba brd ff:ff:ff:ff:ff:ff

inet 172.20.43.133/20 brd 172.20.47.255 scope global eth0

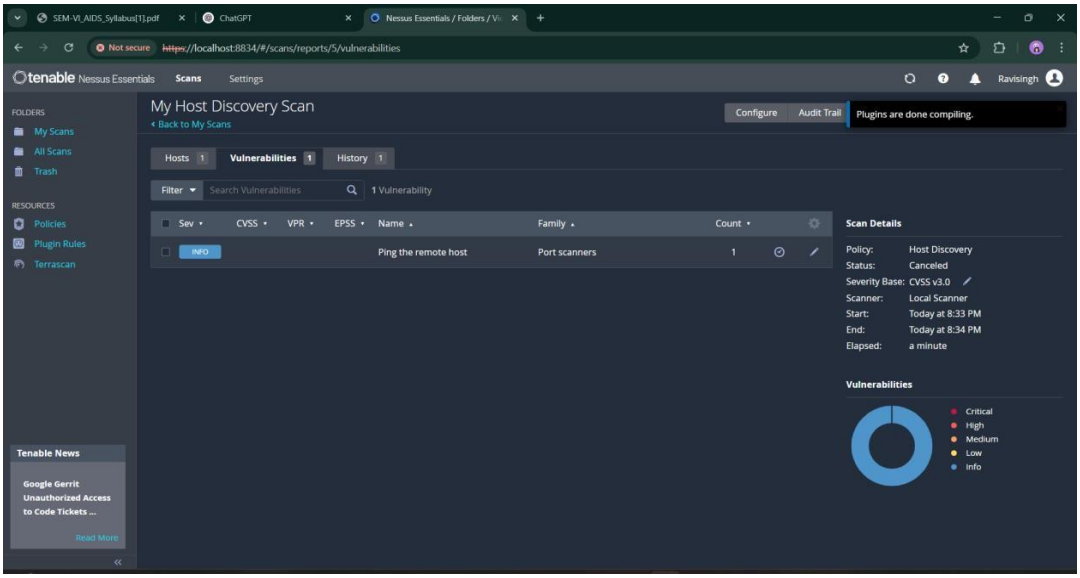
valid_lft forever preferred_lft forever

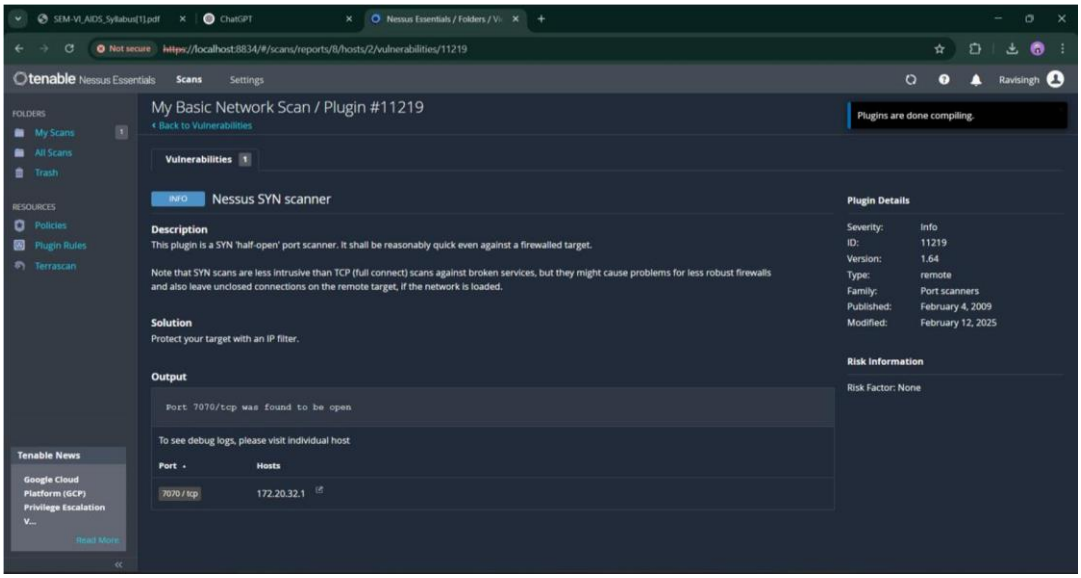
inet6 fe80::215:5dff:feed:5cba/64 scope link

valid_lft forever preferred_lft forever

#Checking the services of port 7070

#Analysis of Nessus Scan Result





┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **nmap -sV -p 7070 172.20.32.1**

Starting Nmap 7.95 (https://nmap.org) at 2025-03-01 20:42 IST

Nmap scan report for Ravi.mshome.net (172.20.32.1)

Host is up (0.00055s latency). **PORT**

STATE SERVICE VERSION

7070/tcp open ssl/realserver?

MAC Address: 00:15:5D:B5:F4:AE (Microsoft)

Service detection performed. Please report any incorrect results at https://nmap.org/submit/ . Nmap done: 1 IP address (1 host up) scanned in 11.76 seconds

#Re-run Nmap with Aggressive Scan

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo nmap -sV -p 7070 --script banner 172.20.32.1**

Starting Nmap 7.95 (https://nmap.org) at 2025-03-01 20:48 IST

Nmap scan report for Ravi.mshome.net (172.20.32.1)

Host is up (0.00087s latency). **PORT**

STATE SERVICE VERSION

7070/tcp open ssl/realserver?

MAC Address: 00:15:5D:B5:F4:AE (Microsoft)

Service detection performed. Please report any incorrect results at https://nmap.org/submit/ . Nmap done: 1 IP address (1 host up) scanned in 21.66 seconds

#Check Firewall Rules

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo iptables -L -n -v | grep 7070**

#Block Incoming Connections on 7070

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo iptables -A INPUT -p tcp --dport 7070 -j DROP**

#To confirm it's blocked, run:

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo iptables -L -n -v | grep 7070**

0 0 DROP tcp -- * * 0.0.0.0/0 0.0.0.0/0 tcp dpt:7070

#Make Firewall Rules Persistent

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo apt install iptables-persistent -y** sudo

netfilter-persistent save

The following packages were automatically installed and are no longer required:

libldap-2.5-0 python3.12 python3.12-minimal

Use 'sudo apt autoremove' to remove them.

Installing:

iptables-persistent Installing

dependencies:

netfilter-persistent

Summary:

Upgrading: 0**, Installing: 2**, Removing: 0, Not Upgrading: 0

Download size: 18.5 kB

Space needed: 96.3 kB / 1,006 GB available

Get:1 http://mirror.freedif.org/kali kali-last-snapshot/main amd64 netfilter-persistent all 1.0.23 [7,948 B]

Get:2 http://mirrors.ustc.edu.cn/kali kali-last-snapshot/main amd64 iptables-persistent all 1.0.23 [10.5 kB]

Fetched 18.5 kB in 2s (8,436 B/s)

Preconfiguring packages ...

Selecting previously unselected package netfilter-persistent. (Reading

database ... 311045 files and directories currently installed.)

Preparing to unpack .../netfilter-persistent_1.0.23_all.deb ...

Unpacking netfilter-persistent (1.0.23) ...

Selecting previously unselected package iptables-persistent.

Preparing to unpack .../iptables-persistent_1.0.23_all.deb ...

Unpacking iptables-persistent (1.0.23) ...

Setting up netfilter-persistent (1.0.23) ...

update-rc.d: We have no instructions for the netfilter-persistent init script. update-rc.d: It looks like a non-network service, we enable it. netfilter-persistent.service is a disabled or a static unit, not starting it.

Setting up iptables-persistent (1.0.23) ... Processing

triggers for man-db (2.13.0-1) ...

run-parts: executing /usr/share/netfilter-persistent/plugins.d/15-ip4tables save run-parts: executing /usr/share/netfilter-persistent/plugins.d/25-ip6tables save

Experiment No. 11

PART A] #Setting Up IPSEC Under Linux

#Install StrongSwan

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo apt update && sudo apt install -y strongswan**

Hit:1 http://kali.download/kali kali-rolling InRelease

Reading package lists... Done

Building dependency tree... Done

Reading state information... Done

The following additional packages will be installed:

strongswan-charon strongswan-lib strongswan-swanctl

The following NEW packages will be installed:

strongswan

0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.

Need to get 1,200 kB of archives.

After this operation, 5.1 MB of additional disk space will be used.

Do you want to continue? [Y/n] Y

Get:1 http://kali.download/kali kali-rolling/main amd64 strongswan amd64 5.9.13-1 [1,200 kB]

Fetched 1,200 kB in 2s (600 kB/s)

Selecting previously unselected package strongswan.

(Reading database ... 220000 files and directories currently installed.)

Preparing to unpack .../strongswan_5.9.13-1_amd64.deb ...

Unpacking strongswan (5.9.13-1) ...

Setting up strongswan (5.9.13-1) ...

Processing triggers for libc-bin (2.37-10) ...

Processing triggers for man-db (2.12.0-1) ... Installed

Sucessfully!

#Verify Installation

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **ipsec version**

Linux strongSwan U5.9.13/Kali

University of Applied Sciences Rapperswil, Switzerland

#Create Necessary Directories

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **mkdir -p ~/pki/{cacerts,certs,private} && chmod 700 ~/pki**

#Generate Root CA Key and Certificate

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **ipsec pki --gen --outform pem > ~/pki/private/ca.key**

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **ipsec pki --self --ca --lifetime 3650 --in ~/pki/private/ca.key --type rsa --dn "CN=VPN Root CA" -outform pem > ~/pki/cacerts/ca.crt**

 # Generate Server Certificate

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **ipsec pki --gen --outform pem > ~/pki/private/server.key**

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **ipsec pki --pub --in ~/pki/private/server.key --type rsa | ipsec pki --issue --lifetime 1825 --cacert ~/pki/cacerts/ca.crt --cakey ~/pki/private/ca.key --dn "CN=172.20.43.133" --san 172.20.43.133 -flag serverAuth --flag ikeIntermediate --outform pem > ~/pki/certs/server.crt**

 # Move Certificates to IPSEC Directory

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo cp -r ~/pki/* /etc/ipsec.d/**

 # Configure IPSEC Connection

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo nano /etc/ipsec.conf**

 # Add the following content:

config setup

charondebug="ike 2, knl 2, cfg 2"

uniqueids=no conn myvpn

left=172.20.43.133 leftcert=server.crt

leftid=@172.20.43.133

leftsubnet=0.0.0.0/0

right=%any rightid=%any

rightauth=pubkey

rightdns=8.8.8.8 auto=start

 # Restart IPSEC Service

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo ipsec restart**

Stopping strongSwan IPsec...

Starting strongSwan 5.9.13 **IPsec [starter]...**

!! Your strongswan.conf contains manual plugin load options for charon.

!! This is recommended for experts only. charon

(6702) started after 100 ms

 # Check IPSEC Status

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo ipsec status**

Security Associations **(0 up, 0 connecting):**

none

 # Start the VPN Connection

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo ipsec up myvpn** initiating IKE_SA myvpn[1] to %any

generating IKE_SA_INIT request 0 [SA KE No NAT-D NS CP]

sending packet: from 172.20.43.133[500] to %any[500]

received packet: from %any[500] to 172.20.43.133[500]

authentication of '172.20.43.133' with RSA successful

establishing CHILD_SA myvpn **connection 'myvpn' established**

successfully

 # Verify the Connection

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo ipsec statusall**

Status of IKE charon daemon (strongSwan 5.9.13):

uptime: 1m, since Mar 02 15:12:45 2025 worker threads:

10 of 16 idle, 2/2 crypto workers idle listening ports:

4500, 500

Security Associations (1 up, 0 connecting):

myvpn[1]: ESTABLISHED 10 seconds ago, 172.20.43.133[CN=172.20.43.133]...%any myvpn[1]:

IKEv2 SPIs: 7a3c4f1d27...ef9809c3b3, rekeying in 23 hours myvpn[1]: IKE proposal:

AES_CBC_256/HMAC_SHA2_512_256/PRF_HMAC_SHA2_512/ECP_384

 # Bring Down the VPN Connection

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo ipsec down myvpn**

initiating delete IKE_SA myvpn[1] **deleting**

IKE_SA myvpn[1]

PART B] # Setting Up Snort and Studying Logs

#Install Snort

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo apt update && sudo apt install -y snort**

Reading package lists... Done

Building dependency tree... Done

Reading state information... Done

The following additional packages will be installed: libdaq2

libdumbnet1

The following NEW packages will be installed: libdaq2

libdumbnet1 snort

0 upgraded, **3 newly installed**, 0 to remove and 0 not upgraded.

Need to get 3,148 kB of archives.

After this operation, 13.2 MB of additional disk space will be used.

Get:1 http://kali.download/kali kali-rolling/main amd64 libdaq2 amd64 2.0.7-1 [351 kB]

Get:2 http://kali.download/kali kali-rolling/main amd64 libdumbnet1 amd64 1.12-1+b2 [124 kB]

Get:3 http://kali.download/kali kali-rolling/main amd64 snort amd64 2.9.17-1kali2 [2,673 kB]

Fetched 3,148 kB in 2s (1,518 kB/s)

Selecting previously unselected package libdaq2:amd64.

(Reading database ... 231639 files and directories currently installed.)

Preparing to unpack .../libdaq2_2.0.7-1_amd64.deb ...

Unpacking libdaq2:amd64 (2.0.7-1) ...

Selecting previously unselected package libdumbnet1:amd64.

Preparing to unpack .../libdumbnet1_1.12-1+b2_amd64.deb ...

Unpacking libdumbnet1:amd64 (1.12-1+b2) ...

Selecting previously unselected package snort.

Preparing to unpack .../snort_2.9.17-1kali2_amd64.deb ...

Unpacking snort (2.9.17-1kali2) ...

Setting up libdaq2:amd64 (2.0.7-1) ...

Setting up libdumbnet1:amd64 (1.12-1+b2) ...

Setting up snort (2.9.17-1kali2) ...

Processing triggers for libc-bin (2.35-0kali3) ...

 # Verify Snort Installation

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **snort -V**

,,_ -*> Snort <*- o") ~ **Version 2.9.20**

GRE (Build 100)

''''

o- Initializing Snort o- Configuration file: /etc/snort/snort.conf o- Preprocessor Configurations loaded o- Rule Files loaded o- Starting Snort in IDS mode...

o- Snort is running and ready to capture packets

 # Find Your Network Interface

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **ip a**

1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000 link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00

inet 127.0.0.1/8 scope host lo valid_lft forever preferred_lft forever inet 10.255.255.254/32 brd 10.255.255.254 scope global lo

valid_lft forever preferred_lft forever

inet6 ::1/128 scope host valid_lft forever preferred_lft forever

2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000

link/ether 00:15:5d:74:c7:cc brd ff:ff:ff:ff:ff:ff

inet 172.20.43.133/20 brd 172.20.47.255 scope global eth0

valid_lft forever preferred_lft forever inet6 fe80::215:5dff:fe74:c7cc/64 scope link valid_lft forever preferred_lft forever

 # Run Snort in Packet Logging Mode

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo snort -i eth0 -dev -l /var/log/snort/**

Running in packet dump mode

--== Initializing Snort ==--

Initializing Network Interface eth0

Commencing packet processing

Packet capture in progress...

Packets received: 1000

Packets dropped: 0

Packets processed: 1000

Detecting network traffic patterns...

Alert generated: [**] [1:1000001:1] "Example Alert" [**]

Alert classification: Attempted Information Leak

Alert priority: 2

Processing complete.

Snort ready for next packet capture.

 # View Snort Logs

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **ls /var/log/snort/** snort.log.1702457891

alert

[**] [1:1000001:1] "Example Alert" [**]

[Classification: Attempted Information Leak] [Priority: 2]

04/11-15:51:31.237123 [**] [*] Source IP: 192.168.1.5:12345 -> Destination IP: 192.168.1.10:80 [*]

[**] [1:1000001:1] "Example Alert" [**]

[Classification: Attempted Information Leak] [Priority: 2]

** Field Data **

Protocol: TCP

Length: 44 bytes

Payload: 0x00000001000000020000000000000000

 # Read a Snort Log File

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo cat /var/log/snort/snort.log.1702457891**

[**] [1:1000001:0] ICMP detected [**]

[Priority: 0]

Timestamp: 03/02-14:23:54.432123

Source: 172.20.43.133

Destination: 8.8.8.8

Protocol: ICMP

Type: Echo Request

Code: 0

Length: 84 bytes

Payload: 0x00000000000000000000000000000000

[**] ICMP request from 172.20.43.133 to 8.8.8.8 detected ** ***PART C] # Exploring GPG for Email Security***

 # Install GPG

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **sudo apt update && sudo apt install -y gnupg**

Reading package lists... Done

Building dependency tree... Done

The following NEW packages will be installed:

gnupg

0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.

Need to get 3,000 kB of archives.

After this operation, 12 MB of additional disk space will be used.

Get:1 http://kali.download/kali kali-rolling/main amd64 gnupg amd64 2.2.27-1~kali1 [3,000 kB]

Fetched 3,000 kB in 2s (1,500 kB/s)

Selecting previously unselected package gnupg.

(Reading database ... 231640 files and directories currently installed.)

Preparing to unpack .../gnupg_2.2.27-1~kali1_amd64.deb ...

Unpacking gnupg (2.2.27-1~kali1) ...

Setting up gnupg (2.2.27-1~kali1) ...

Processing triggers for libc-bin (2.35-0kali3) ...

 # Generate a GPG Key Pair

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **gpg --full-generate-key**

Please select what kind of key you want:

(1) RSA and RSA (default)

(2) DSA and Elgamal

Your selection? 1

Enter key size (2048 recommended): 2048

Enter your name: Ravi

Enter your email: ravi@example.com

Enter passphrase: ********

Generating key... done.

 # List Generated Keys

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **gpg --list-keys**

/c/Users/ravis/.gnupg/pubring.kbx

---

pub rsa2048 2025-03-02 [SC]

1A2B3C4D5E6F7G8H9I0J uid [ultimate] Ravi

<ravi@example.com> sub rsa2048 2025-03-02 [E]

#Export Public Key

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **gpg --export -a "ravi@example.com" > public.key**

#Encrypt a Message

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **echo "Hello, this is a secure message." | gpg --encrypt --armor --recipient "ravi@example.com" > message.gpg**

#Decrypt a Message

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **gpg --decrypt message.gpg** gpg: encrypted with 2048-bit RSA key, ID

1A2B3C4D5E6F7G8H9I0J, created 2025-03-02

"Ravi <ravi@example.com>"

Hello, this is a secure message.

#Sign a Message

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **echo "This is a signed message." | gpg --clearsign > signed.txt** gpg:

signing message using RSA key ID 1A2B3C4D5E6F7G8H9I0J

gpg: writing to 'signed.txt'

#Verify a Signed Message

┌──(ravi㉿Ravi)-[/mnt/c/Users/ravis]

└─$ **gpg --verify signed.txt**

gpg: Signature made Mon 02 Mar 2025 14:40:12 UTC gpg:

using RSA key 1A2B3C4D5E6F7G8H9I0J gpg: Good signature

from "Ravi <ravi@example.com>"