Project-1 Report
On

Network Intrusion Detection System (NIDS) Rule Creation and Testing Lab

INFOTACT SOLUTIONS

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GitHub Link: https://tinyurl.com/ym6dvf6n
Youtube Link: https://tinyurl.com/4pykhmyy

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Project 1: NIDS Rule Creation and Testing Lab 🕵️

Network Intrusion Detection System (NIDS) Rule Creation and Testing Lab

Problem Statement: Develop and test a robust set of custom rules for a Network Intrusion Detection System (NIDS) to identify and flag common cyber-attacks in real-time, reducing the mean time to detect threats within a network.

Abstract

A concise summary of what you built: a virtualised lab, Snort NIDS on Ubuntu, a Kali attacker, and a custom rule to detect brute-force attempts.

Use Case: Create a virtualized security lab where an open-source NIDS like Snort or Suricata is deployed to monitor network traffic. The system will be configured with custom rules designed to detect specific malicious activities, such as reconnaissance scans, brute-force login attempts, and known malware communication, providing immediate alerts to security analysts for investigation.

Tools & Technologies Used:

- NIDS Engine: Snort,
- Operating System: Kali Linux 2025 (Attacker Machine), Ubuntu Server 24.04.10 (Target Machine)
- Virtualization: VirtualBox
- Attack & Testing Tools: Hydra
- Scripting & Analysis: Bash, Wireshark

Focus Directory is

1. Target Machine (Ubuntu Server)

```
cybermonk@myLap:~ $ cd /etc/snort/rules/local.rules
```

2. Attacker Machine

This guide details how to set up Snort, a Network Intrusion Detection System (NIDS), to detect an SSH brute-force attack.

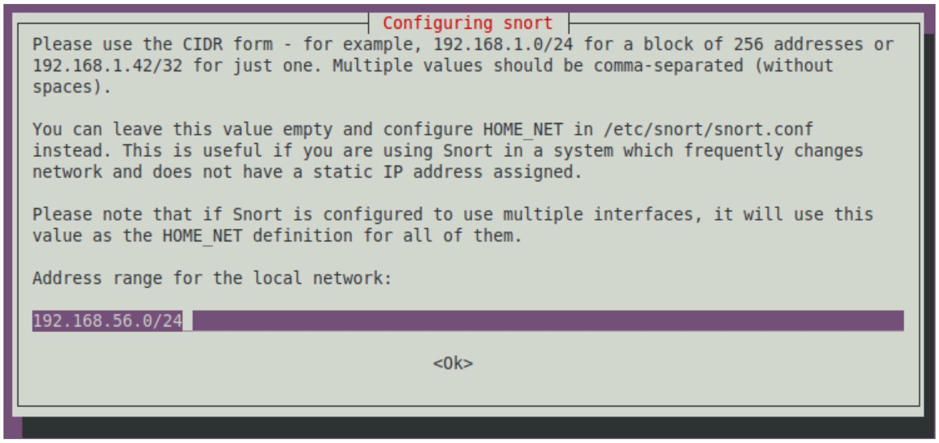
Step 1: Setup and Installation

a. **Install Ubuntu Server:** Use VirtualBox or VMware to create a new virtual machine. Install a minimal Ubuntu Server. Ensure the network adapter is set to "Bridged Mode" to get an IP address from your local network.

b. **Install Snort**: Once the VM is running, update your package list and install Snort.

```
cybermonk@myLap:~ $sudo apt update
cybermonk@myLap:~ $sudo apt install snort -y
```

c. Configure Network Interface: During installation, you'll be prompted for the network interface to monitor. Enter the name of your primary interface (e.g., eth0 or enp0s3). You can find it by running the ip command. Also, provide your local network range in CIDR notation (e.g., 192.168.56.0/24).



```
Configuring snort

Please use the CIDR form - for example, 192.168.1.0/24 for a block of 256 addresses or
192.168.1.42/32 for just one. Multiple values should be comma-separated (without
spaces).

You can leave this value empty and configure HOME_NET in /etc/snort/snort.conf
instead. This is useful if you are using Snort in a system which frequently changes
network and does not have a static IP address assigned.

Please note that if Snort is configured to use multiple interfaces, it will use this
value as the HOME_NET definition for all of them.

Address range for the local network:

192.168.56.0/24

                                        <Ok>
```

Step 2: Create a Custom NIDS Rule

a. **Open the Rules File**: Snort's custom rules can be placed in /etc/snort/rules/local.rules. Open this file with a text editor like nano.

Note:

> Below is a ready-to-paste ***local.rules*** file (Snort) **and** a set of test commands / scripts to generate traffic that should trigger each rule. Copy ***local.rules*** into ***/etc/snort/rules/local.rules*** (or your Suricata **local.rules** equivalent after minor syntax checks). All SIDs use >= ***1000000***.

```
cybermonk@myLap:~ $sudo vim /etc/snort/rules/local.rules
```

```
# local.rules - Custom Snort rules (lab)
# Place this file at /etc/snort/rules/local.rules
# All SIDs >= 1000000 (local rules)

################################################################################
# SSH brute-force (alert)
# Triggers after 5 or more established SSH connection attempts from same src within 60s
################################################################################
alert tcp any any -> $HOME_NET 22 (msg:"SSH Brute-Force Attempt Detected";
flow:to_server,established; detection_filter:track by_src, count 5, seconds 60; classtype:attempted-admin;
priority:1; sid:1000002; rev:2;)

# Optional IPS (drop) version - ONLY enable if Snort is running inline/IPS
# drop tcp any any -> $HOME_NET 22 (msg:"SSH Brute-Force Attempt - Block";
flow:to_server,established; detection_filter:track by_src, count 5, seconds 60; classtype:attempted-admin;
priority:1; sid:1000003; rev:1;)

################################################################################
# FTP brute-force (alert)
# Triggers after 10 or more established FTP connection attempts from same src within 60s
################################################################################
alert tcp any any -> $HOME_NET 21 (msg:"FTP Brute-Force Attempt Detected";
flow:to_server,established; detection_filter:track by_src, count 10, seconds 60;
classtype:attempted-admin; priority:1; sid:1000200; rev:1;)

################################################################################
# Nmap scan detection (SYN / FIN / XMAS)
# Tune count/seconds for your environment to reduce false positives.
################################################################################

# Nmap SYN scan (many SYNs to many ports)
alert tcp any any -> $HOME_NET any (msg:"Nmap SYN scan detected"; flags:S; detection_filter:track
by_src, count 20, seconds 60; classtype:attempted-recon; priority:2; sid:1000100; rev:1;)

# Nmap FIN scan
alert tcp any any -> $HOME_NET any (msg:"Nmap FIN scan detected"; flags:F; detection_filter:track
by_src, count 20, seconds 60; classtype:attempted-recon; priority:2; sid:1000101; rev:1;)

# Nmap XMAS scan (FIN,PSH,URG)
alert tcp any any -> $HOME_NET any (msg:"Nmap XMAS scan detected"; flags:FPU;
detection_filter:track by_src, count 20, seconds 60; classtype:attempted-recon; priority:2; sid:1000102;
rev:1;)

################################################################################
```

```
# Simple HTTP C2 beacon signature (example)
# Matches repeated GETs for /update.php to web ports (80,8080). Adjust URI & ports for your lab.
# Uses uricontent so rule header uses TCP (required by Snort).
##############################################################################
alert tcp any any -> $HOME_NET 80,8080 (msg:"Possible C2 Beacon - suspicious URI /update.php"; flow:to_server,established; uricontent:"/update.php"; nocase; detection_filter:track by_src, count 5, seconds 300; classtype:trojan-activity; priority:2; sid:1000300; rev:2;)

# If you want to monitor any TCP destination (less strict), use this variant instead:
# alert tcp any any -> $HOME_NET any (msg:"Possible C2 Beacon - suspicious URI /update.php"; flow:to_server,established; uricontent:"/update.php"; nocase; detection_filter:track by_src, count 5, seconds 300; classtype:trojan-activity; priority:2; sid:1000301; rev:1;)

##############################################################################
# End of local.rules
##############################################################################
```

Validate Snort config:

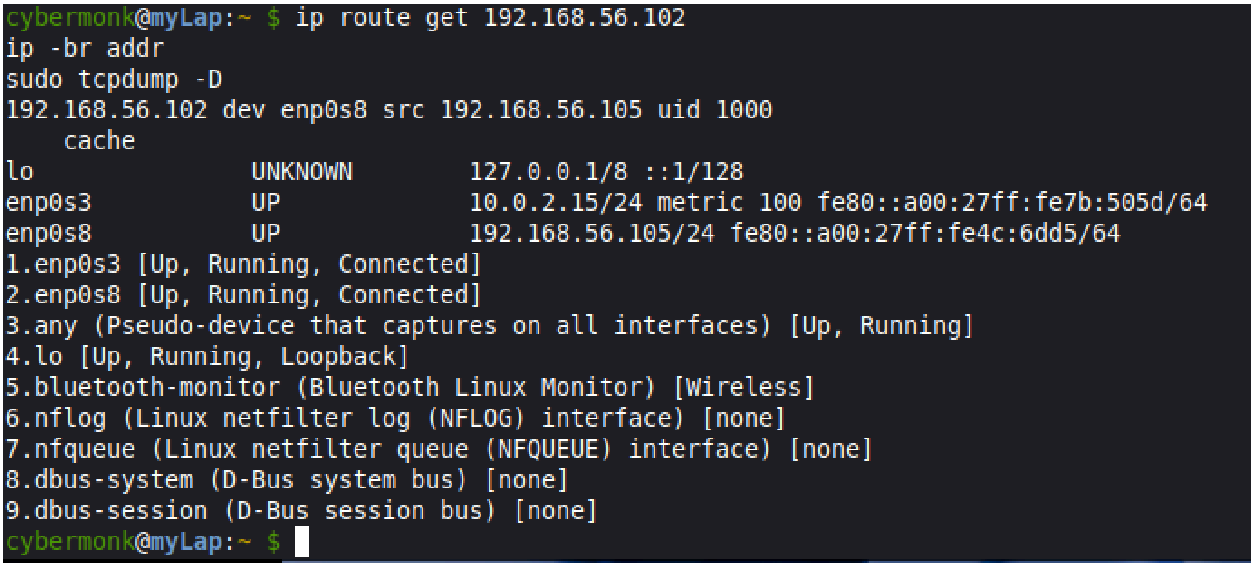
```
cybermonk@myLap:~ $ sudo snort -T -c /etc/snort/snort.conf
```

Save the file to .txt file

```
cybermonk@myLap:~ $ sudo snort -T -c /etc/snort/snort.conf > /home/cybermonk/snort_test_output.txt 2>&1
```

Step 3: Test the Rule

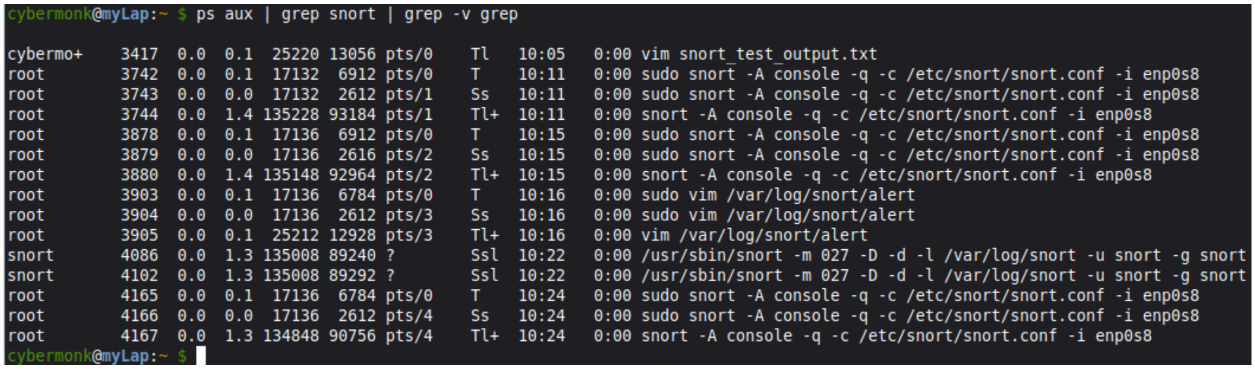
```
cybermonk@myLap:~ $ip route get 192.168.56.102
ip -br addr
sudo tcpdump -D
```



```
cybermonk@myLap:~ $ ip route get 192.168.56.102
ip -br addr
sudo tcpdump -D
192.168.56.102 dev enp0s8 src 192.168.56.105 uid 1000
    cache
lo               UNKNOWN        127.0.0.1/8 ::1/128
enp0s3           UP             10.0.2.15/24 metric 100 fe80::a00:27ff:fe7b:505d/64
enp0s8           UP             192.168.56.105/24 fe80::a00:27ff:fe4c:6dd5/64
1.enp0s3 [Up, Running, Connected]
2.enp0s8 [Up, Running, Connected]
3.any (Pseudo-device that captures on all interfaces) [Up, Running]
4.lo [Up, Running, Loopback]
5.bluetooth-monitor (Bluetooth Linux Monitor) [Wireless]
6.nflog (Linux netfilter log (NFLOG) interface) [none]
7.nfqueue (Linux netfilter queue (NFQUEUE) interface) [none]
8.dbus-system (D-Bus system bus) [none]
9.dbus-session (D-Bus session bus) [none]
cybermonk@myLap:~ $ 
```

This command:

cybermonk@myLap:~ $*ps aux | grep snort | grep -v grep*



```
cybermonk@myLap:~ $ ps aux | grep snort | grep -v grep

cybermo+    3417  0.0  0.1  25220 13056 pts/0    Tl   10:05   0:00 vim snort_test_output.txt
root        3742  0.0  0.1  17132  6912 pts/0    T    10:11   0:00 sudo snort -A console -q -c /etc/snort/snort.conf -i enp0s8
root        3743  0.0  0.0  17132  2612 pts/1    Ss   10:11   0:00 sudo snort -A console -q -c /etc/snort/snort.conf -i enp0s8
root        3744  0.0  1.4 135228 93184 pts/1    Tl+  10:11   0:00 snort -A console -q -c /etc/snort/snort.conf -i enp0s8
root        3878  0.0  0.1  17136  6912 pts/0    T    10:15   0:00 sudo snort -A console -q -c /etc/snort/snort.conf -i enp0s8
root        3879  0.0  0.0  17136  2616 pts/2    Ss   10:15   0:00 sudo snort -A console -q -c /etc/snort/snort.conf -i enp0s8
root        3880  0.0  1.4 135148 92964 pts/2    Tl+  10:15   0:00 snort -A console -q -c /etc/snort/snort.conf -i enp0s8
root        3903  0.0  0.1  17136  6784 pts/0    T    10:16   0:00 sudo vim /var/log/snort/alert
root        3904  0.0  0.0  17136  2612 pts/3    Ss   10:16   0:00 sudo vim /var/log/snort/alert
root        3905  0.0  0.1  25212 12928 pts/3    Tl+  10:16   0:00 vim /var/log/snort/alert
snort       4086  0.0  1.3 135008 89240 ?        Ssl  10:22   0:00 /usr/sbin/snort -m 027 -D -d -l /var/log/snort -u snort -g snort
snort       4102  0.0  1.3 135008 89292 ?        Ssl  10:22   0:00 /usr/sbin/snort -m 027 -D -d -l /var/log/snort -u snort -g snort
root        4165  0.0  0.1  17136  6784 pts/0    T    10:24   0:00 sudo snort -A console -q -c /etc/snort/snort.conf -i enp0s8
root        4166  0.0  0.0  17136  2612 pts/4    Ss   10:24   0:00 sudo snort -A console -q -c /etc/snort/snort.conf -i enp0s8
root        4167  0.0  1.3 134848 90756 pts/4    Tl+  10:24   0:00 snort -A console -q -c /etc/snort/snort.conf -i enp0s8
cybermonk@myLap:~ $ 
```

is used to **find all running processes related to Snort**.

Show the active ***local.rules*** on the target (verify the rules exist and SIDs):

cybermonk@myLap:~ $ *nl -ba /etc/snort/rules/local.rules | sed -n '1,200p'*

Note:

Make sure the rules we created are present (SIDs 1000002, 1000100, etc.) and that there are no ***alert http*** headers left.

b. Check Snort logs (if Snort is running as a daemon):

```
cybermonk@myLap:~ $ sudo ls -l /var/log/snort

sudo tail -n 200 /var/log/snort/alert || sudo tail -n 200 /var/log/snort/fast.log || true
```

```
total 740

-rw-r--r-- 1 root adm      0 Oct 12 05:33 snort.alert.fast

-rw------- 1 root adm      0 Oct 12 06:09 snort.log.1760249370

-rw------- 1 root adm      0 Oct 12 06:14 snort.log.1760249657

-rw------- 1 root adm 376618 Oct 12 06:56 snort.log.1760251584

-rw------- 1 root adm 378458 Oct 12 08:50 snort.log.1760258824

tail: cannot open '/var/log/snort/alert' for reading: No such file or directory

tail: cannot open '/var/log/snort/fast.log' for reading: No such file or directory
```

```
cybermonk@myLap:~ $
```

If the directory is empty or no alert file, Snort may not be logging or running.

Note:

Thanks here— the missing ***/var/log/snort/alert*** tells us Snort isn't writing alerts to that file (either it's logging elsewhere, running only in the console, or the log directory/permissions aren't correct). Let's fix and verify **quickly**.

C. Creating snort alert directory

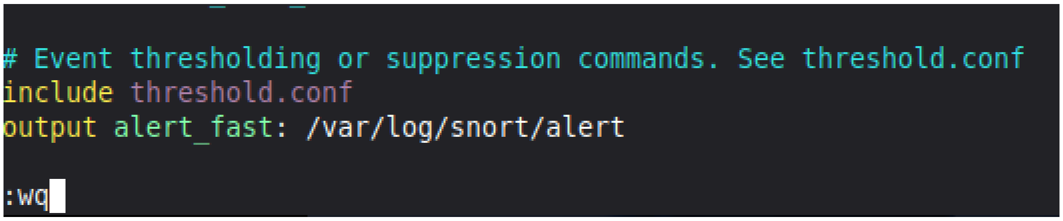
Kill all extra Snort processes

```
cybermonk@myLap:~ $ sudo pkill snort
```

Daemon mode with alert logging (for persistent logging):

Edit ***/etc/snort/snort.conf*** to add:

```
output alert_fast: /var/log/snort/alert
```



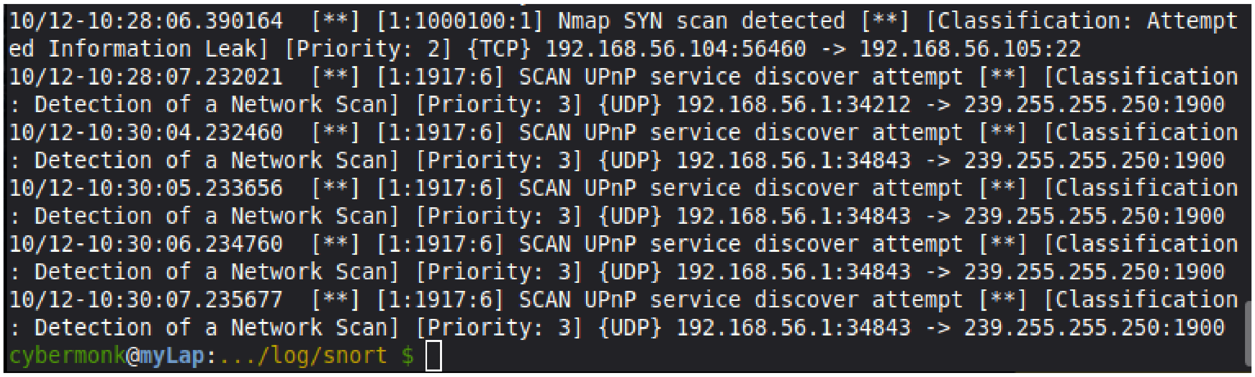
```
# Event thresholding or suppression commands. See threshold.conf
include threshold.conf
output alert_fast: /var/log/snort/alert

:wq
```

Make sure ***/var/log/snort*** exists and is owned by **snort:**

cybermonk@myLap:~ $ *sudo mkdir -p /var/log/snort*
sudo chown snort:snort /var/log/snort
sudo chmod 750 /var/log/snort

cybermonk@myLap:~ $

Now, alerts will be logged to **/var/log/snort/alert.**



```
10/12-10:28:06.390164  [**] [1:1000100:1] Nmap SYN scan detected [**] [Classification: Attempt
ed Information Leak] [Priority: 2] {TCP} 192.168.56.104:56460 -> 192.168.56.105:22
10/12-10:28:07.232021  [**] [1:1917:6] SCAN UPnP service discover attempt [**] [Classification
: Detection of a Network Scan] [Priority: 3] {UDP} 192.168.56.1:34212 -> 239.255.255.250:1900
10/12-10:30:04.232460  [**] [1:1917:6] SCAN UPnP service discover attempt [**] [Classification
: Detection of a Network Scan] [Priority: 3] {UDP} 192.168.56.1:34843 -> 239.255.255.250:1900
10/12-10:30:05.233656  [**] [1:1917:6] SCAN UPnP service discover attempt [**] [Classification
: Detection of a Network Scan] [Priority: 3] {UDP} 192.168.56.1:34843 -> 239.255.255.250:1900
10/12-10:30:06.234760  [**] [1:1917:6] SCAN UPnP service discover attempt [**] [Classification
: Detection of a Network Scan] [Priority: 3] {UDP} 192.168.56.1:34843 -> 239.255.255.250:1900
10/12-10:30:07.235677  [**] [1:1917:6] SCAN UPnP service discover attempt [**] [Classification
: Detection of a Network Scan] [Priority: 3] {UDP} 192.168.56.1:34843 -> 239.255.255.250:1900
cybermonk@myLap:.../log/snort $ 
```

Note: *sudo tail -n 200 /var/log/snort/alert || sudo tail -n 200 /var/log/snort/fast.log || true*

d.Start Snort in console (live) and capture verbose errors — run this in a terminal and leave it open:

sudo snort -A console -q -c /etc/snort/snort.conf -i <interface>
Replace **<interface>** with your actual interface (***ip a*** to check).

Replace **eth0** with your actual interface (***ip a*** to check).

Leave this terminal open — alerts will appear live.

Step 4. Perform the Attack (Kali Machine):

a. Script (save on attacker VM as **run_nids_tests.sh**)

On your **attacker (Kali)** machine run the following commands to make the correct script, make it executable, and run it. (This writes a single file ***/home/kali/run_nids_tests.sh*.**)

```
#!/usr/bin/env bash
# run_nids_tests.sh - Attacker-side NIDS test script
# Usage: sudo ./run_nids_tests.sh TARGET_IP [IFACE]
# Default TARGET_IP = 192.168.56.102

set -u
TARGET=${1:-192.168.56.102}
IFACE=${2:-$(ip route get "$TARGET" 2>/dev/null | awk '/dev/ {print $5; exit}')}

PCAP="/tmp/nids_test_${TARGET//./_}.pcap"
TCPDUMP_PID_FILE="/tmp/tcpdump_nids_test.pid"

echo "[*] Target: $TARGET"
if [[ -z "$IFACE" || "$IFACE" == "0.0.0.0" ]]; then
  echo "[!] Interface autodetect failed. List your interfaces with: ip -br addr"
  echo "    Re-run the script with the interface as second argument, e.g.:"
  echo "    sudo ./run_nids_tests.sh $TARGET eth1"
  exit 2
fi
echo "[*] Interface: $IFACE"
echo "[*] PCAP file: $PCAP"
echo

# require sudo
if [[ $EUID -ne 0 ]]; then
  echo "[!] Please run with sudo. Exiting."
  exit 3
fi

# Check for required commands and warn (we won't attempt to install)
for cmd in tcpdump nmap curl ssh; do
  if ! command -v "$cmd" >/dev/null 2>&1; then
    echo "[!] Warning: '$cmd' not found. Some tests may be skipped."
  fi
done
```

```
# start tcpdump capturing traffic between attacker and target (if tcpdump exists)
if command -v tcpdump >/dev/null 2>&1; then
  echo "[*] Starting tcpdump..."
  tcpdump -i "$IFACE" host "$TARGET" -w "$PCAP" 2>/dev/null &
  TCPDUMP_PID=$!
  echo $TCPDUMP_PID > "$TCPDUMP_PID_FILE"
  sleep 1
  echo "[*] tcpdump started (pid $TCPDUMP_PID)."
else
  echo "[!] tcpdump not installed — continuing without pcap capture."
fi

# 1) Nmap tests (if nmap installed)
if command -v nmap >/dev/null 2>&1; then
  echo
  echo "==== [Nmap SYN scan] ===="
  nmap -sS -Pn "$TARGET" -oN /tmp/nmap_syn_scan_${TARGET}.txt || true
  sleep 2

  echo
  echo "==== [Nmap FIN scan] ===="
  nmap -sF -Pn "$TARGET" -oN /tmp/nmap_fin_scan_${TARGET}.txt || true
  sleep 2

  echo
  echo "==== [Nmap XMAS scan] ===="
  nmap -sX -Pn "$TARGET" -oN /tmp/nmap_xmas_scan_${TARGET}.txt || true
  sleep 2
else
  echo "[!] nmap not installed; skipping Nmap tests."
fi

# 2) SSH brute-force (quick) - simple connect attempts
if command -v ssh >/dev/null 2>&1; then
  echo
  echo "==== [SSH brute attempts x6] ===="
  for i in {1..6}; do
    ssh -o ConnectTimeout=2 -o StrictHostKeyChecking=no invaliduser@"$TARGET"
2>/dev/null || true
    sleep 1
  done
  sleep 2
else
  echo "[!] ssh client not installed; skipping SSH tests."
```

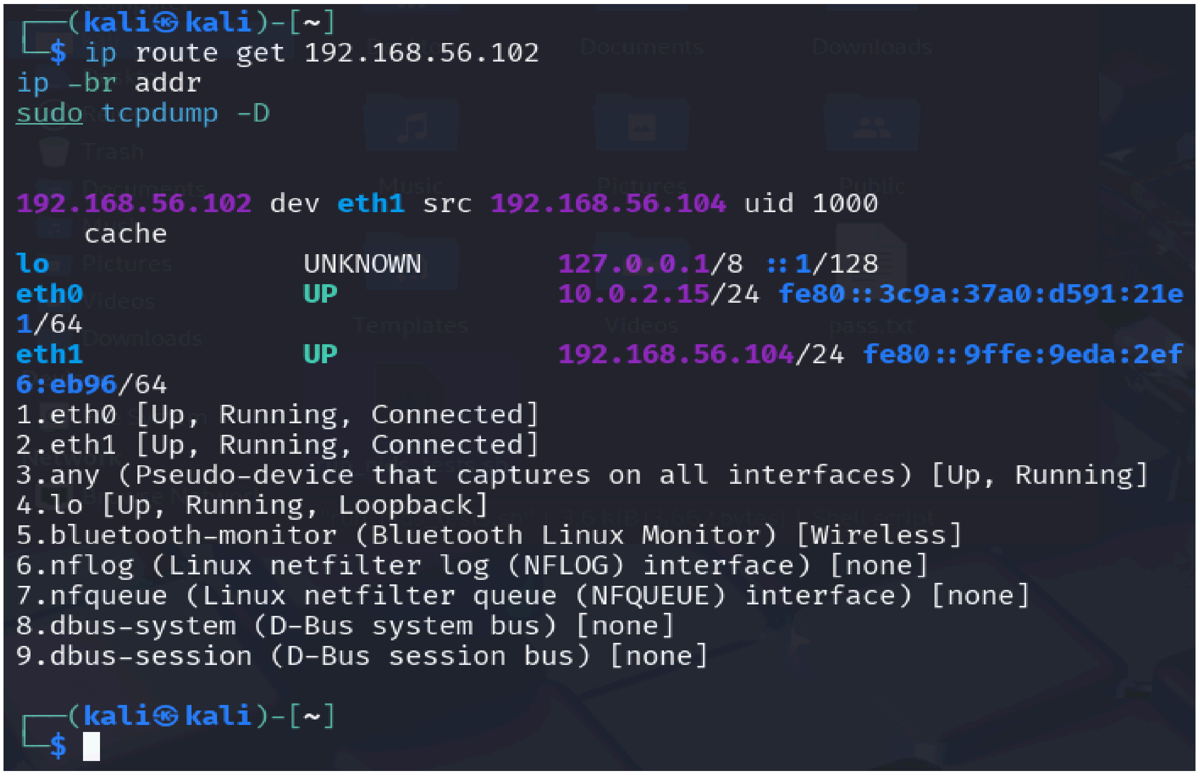
```
fi

# 3) FTP attempts (simple TCP connects) - uses bash TCP socket, always available on modern bash
echo
echo "==== [FTP connect attempts x12] ===="
for i in {1..12}; do
  timeout 3 bash -c "echo > /dev/tcp/$TARGET/21" 2>/dev/null || true
  sleep 1
done
sleep 2

# 4) HTTP beacon simulation - 5 quick GETs to /update.php
if command -v curl >/dev/null 2>&1; then
  echo
  echo "==== [HTTP beacon: GET /update.php x5] ===="
  for i in {1..5}; do
    curl -s -I "http://$TARGET/update.php" >/dev/null 2>&1 || true
    sleep 1
  done
else
  echo "[!] curl not installed; skipping HTTP beacon."
fi

# cleanup tcpdump
if [[ -f "$TCPDUMP_PID_FILE" ]]; then
  TCPDUMP_PID=$(cat "$TCPDUMP_PID_FILE" 2>/dev/null || echo "")
  if [[ -n "$TCPDUMP_PID" ]]; then
    echo
    echo "[*] Stopping tcpdump (pid $TCPDUMP_PID)..."
    kill "$TCPDUMP_PID" 2>/dev/null || true
    sleep 1
  fi
  rm -f "$TCPDUMP_PID_FILE"
fi

echo
echo "[*] Tests finished."
if [[ -f "$PCAP" ]]; then
  echo "[*] PCAP saved to: $PCAP"
else
  echo "[!] No PCAP was captured (tcpdump missing or failed)."
fi
```

```
echo "[*] Nmap outputs (if run): /tmp/nmap_syn_scan_${TARGET}.txt
/tmp/nmap_fin_scan_${TARGET}.txt /tmp/nmap_xmas_scan_${TARGET}.txt"
echo
echo "On the TARGET (NIDS host) check alerts with:"
echo "  sudo tail -n 200 /var/log/snort/alert"
Echo
```

This will create /home/kali/run_nids_tests.sh with the full content and make it executable.

b. Check the file :

```
──(kali㉿kali)-[~]
└─$ ls -l ./run_nids_tests.sh

-rwxrwxr-x 1 kali kali 3662 Oct 12 02:56 ./run_nids_tests.sh
┌──(kali㉿kali)-[~]
└─$ chmod +x run_nids_tests.sh

┌──(kali㉿kali)-[~]
└─$ ip route get 192.168.56.102
ip -br addr
sudo tcpdump -D
```



```
┌──(kali㉿kali)-[~]
└─$ ip route get 192.168.56.102
ip -br addr
sudo tcpdump -D

192.168.56.102 dev eth1 src 192.168.56.104 uid 1000
    cache
lo               UNKNOWN        127.0.0.1/8 ::1/128
eth0             UP             10.0.2.15/24 fe80::3c9a:37a0:d591:21e
1/64
eth1             UP             192.168.56.104/24 fe80::9ffe:9eda:2ef
6:eb96/64
1.eth0 [Up, Running, Connected]
2.eth1 [Up, Running, Connected]
3.any (Pseudo-device that captures on all interfaces) [Up, Running]
4.lo [Up, Running, Loopback]
5.bluetooth-monitor (Bluetooth Linux Monitor) [Wireless]
6.nflog (Linux netfilter log (NFLOG) interface) [none]
7.nfqueue (Linux netfilter queue (NFQUEUE) interface) [none]
8.dbus-system (D-Bus system bus) [none]
9.dbus-session (D-Bus session bus) [none]

┌──(kali㉿kali)-[~]
└─$ 
```

c. Perform the Attack

```
┌──(kali㉿kali)-[~]
└─$ sudo bash -x /home/kali/run_nids_tests.sh 192.168.56.105 eth1
```

If ip could not auto-detect the interface you can provide it as second argument:

```
    sudo ./run_nids_tests.sh 192.168.56.102 eth0
```

d.Verify the Alert (in NIDs machine):

In Target

Check alerts (console or log):

```
cybermonk@myLap:~ $ sudo tail -n 50 /var/log/snort/alert
```

```
# Or watch live
cybermonk@myLap:~ $ sudo tail -f /var/log/snort/alert
```

Or

```
cybermonk@myLap:~ $ sudo journalctl -u snort --no-pager -n 200 || sudo grep -i snort
/var/log/syslog || true
```