

# **ETHICAL HACKING AND PENETRATION TESTING I**

**Dosen pengampuh : RUNAL REZKIAWAN, S.kom., M.T**



**OLEH**

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# LAPORAN PRAKTIKUM

## SIMULASI DOS ATTACK & MITIGASI

### 1. Referensi & Sumber Daya

Berikut adalah referensi yang digunakan dalam praktikum ini:

- Download DVWA: <https://github.com/digininja/DVWA.git>
- Panduan Instalasi DVWA: Sesuai dokumen "DVWA Installation".
- Penggunaan hping3: Alat untuk simulasi paket TCP/IP.

### 2. Langkah-Langkah Praktikum

#### 1) Instalasi Target (DVWA)

Tahap ini bertujuan untuk membangun lingkungan server yang rentan.

##### a) Persiapan Direktori

- `sudo apt update`: Memperbarui daftar paket aplikasi agar sistem siap.

```
(kali@kali)-[/home/kali]
PS> sudo su
[sudo] password for kali:
(root@kali)-[/home/kali]
# sudo apt update
Hit:1 http://http.kali.org/kali kali-rolling InRelease
1453 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

- `cd /var/www/html`: Berpindah ke direktori root web server Apache.

```
(root@kali)-[/home/kali]
# cd /var/www/html
```

- `sudo git clone https://github.com/digininja/DVWA.git`: Mengunduh kode sumber DVWA dari GitHub.

```
(root@kali)-[/var/www/html]
# sudo git clone https://github.com/digininja/DVWA.git
Cloning into 'DVWA' ...
remote: Enumerating objects: 5622, done.
remote: Total 5622 (delta 0), reused 0 (delta 0), pack-reused 5622 (from 1)
Receiving objects: 100% (5622/5622), 2.64 MiB | 400.00 KiB/s, done.
Resolving deltas: 100% (2809/2809), done.
```

## b) Konfigurasi dan Izin

- `cd /var/www/html/DVWA/config`: Masuk ke folder pengaturan.

```
(root@kali)-[/var/www/html]
# cd /var/www/html/DVWA/config
```

- `sudo cp config.inc.php.dist config.inc.php`: Menyalin file contoh konfigurasi menjadi file konfigurasi aktif.

```
(root@kali)-[/var/www/html/DVWA/config]
# sudo cp config.inc.php.dist config.inc.php
```

- `sudo chmod -R 777 /var/www/html/DVWA/`: Memberikan izin akses penuh ke folder DVWA agar aplikasi bisa menulis log dan data.

```
(root@kali)-[/var/www/html/DVWA/config]
# sudo chmod -R 777 /var/www/html/DVWA/
```

## c) Setup Database (MariaDB)

- `sudo mysql -u root -p`: Masuk ke konsol database sebagai pengguna root.

```
(root@kali)-[/var/www/html/DVWA/config]
# sudo mysql -u root -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 43
Server version: 11.8.3-MariaDB-1+b1 from Debian -- Please help get to 10k stars at https://github.com/MariaDB
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> CREATE DATABASE dvwa;
Query OK, 1 row affected (0.023 sec)

MariaDB [(none)]> CREATE USER IF NOT EXISTS 'user' IDENTIFIED BY 'pass';
Query OK, 0 rows affected, 1 warning (0.199 sec)

MariaDB [(none)]> GRANT ALL ON dvwa.* TO 'user';
Query OK, 0 rows affected (0.157 sec)

MariaDB [(none)]> FLUSH PRIVILEGES;
Query OK, 0 rows affected (0.091 sec)

MariaDB [(none)]> EXIT;
Bye
```

- ✓ `CREATE DATABASE dvwa`:: Membuat database baru bernama dvwa.
- ✓ `CREATE USER 'user' IDENTIFIED BY 'pass'`:: Membuat akun pengguna database dengan password pass.
- ✓ `GRANT ALL ON dvwa.* TO 'user'`:: Memberikan izin penuh kepada user untuk mengelola database dvwa.
- ✓ `FLUSH PRIVILEGES`:: Memperbarui hak akses sistem.

✓ EXIT;; untuk keluar

#### d) Edit File Konfigurasi

- `sudo nano /var/www/html/DVWA/config/config.inc.php`: Membuka editor teks untuk mengatur koneksi database.

```
(root@kali)-[/var/www/html/DVWA/config]
# sudo nano /var/www/html/DVWA/config/config.inc.php
```

- Ubah `db_user` menjadi `'user'` dan `db_password` menjadi `'pass'` agar sesuai dengan kredensial database yang baru dibuat dan untuk menghentikannya klik CTRL + O lalu ENTER dan klik CTRL + X
  - Sebelum di ubah

```
$_DVWA = array();
$_DVWA[ 'db_server' ] = getenv('DB_SERVER') ? : '127.0.0.1';
$_DVWA[ 'db_database' ] = getenv('DB_DATABASE') ? : 'dvwa';
$_DVWA[ 'db_user' ] = getenv('DB_USER') ? : 'dvwa';
$_DVWA[ 'db_password' ] = getenv('DB_PASSWORD') ? : 'p@ssw0rd';
$_DVWA[ 'db_port' ] = getenv('DB_PORT') ? : '3306';
```

- Sesudah di ubah

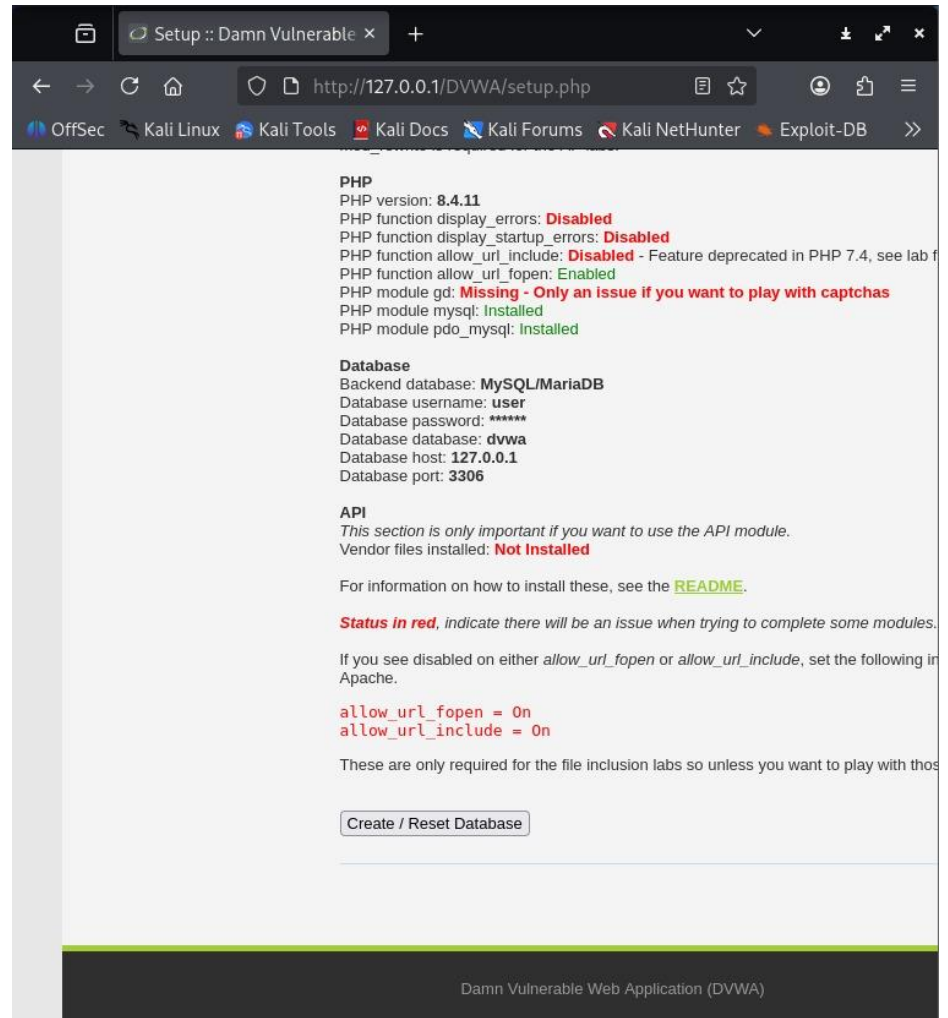
```
$_DVWA = array();
$_DVWA[ 'db_server' ] = getenv('DB_SERVER') ? : '127.0.0.1';
$_DVWA[ 'db_database' ] = getenv('DB_DATABASE') ? : 'dvwa';
$_DVWA[ 'db_user' ] = 'user';
$_DVWA[ 'db_password' ] = 'pass';
$_DVWA[ 'db_port' ] = getenv('DB_PORT') ? : '3306';
```

#### e) Aktivasi Layanan

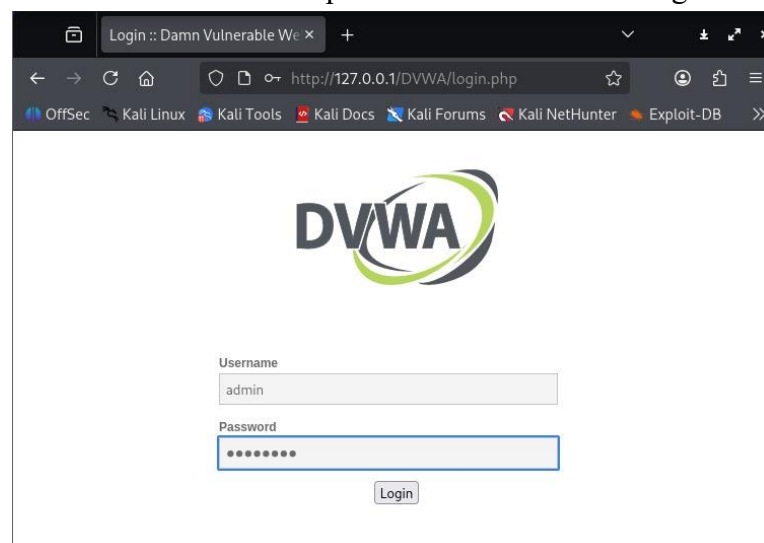
- `sudo service apache2 restart`: Memulai ulang web server agar perubahan konfigurasi terbaca.

```
(root@kali)-[/var/www/html/DVWA/config]
# sudo service apache2 restart
```

- Akses `http://127.0.0.1/DVWA/setup.php` di Firefox, lalu klik "Create / Reset Database".



- Masukkan username dan password kemudian klik login





## 2) Simulasi Serangan (DoS)

Tahap ini menunjukkan bagaimana serangan membebani sumber daya server.

### a) Monitoring (Terminal 1):

- top: Menampilkan penggunaan CPU dan RAM secara *real-time*. Digunakan untuk melihat lonjakan beban akibat serangan dan untuk memberhentikannya klik CTRL + C.

```
zsh: corrupt history file /home/kali/.zsh_history
(kali@kali)-[~]
$ sudo su
[sudo] password for kali:
(root@kali)-[/home/kali]
# top
```

- kondisi komputer sebelum diserang di mana **%id (idle)** sebesar **80.4%** berarti CPU masih santai dan tidak bekerja keras

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
50374	kali	20	0	2473616	119152	94116	S	22.3	5.9	0:12.25	file:/// Content
1097	root	20	0	486420	125144	41320	S	8.2	6.2	8:28.79	Xorg
1450	kali	20	0	893468	54296	25920	S	2.0	2.7	1:49.79	xfwm4
1585	kali	20	0	377340	28836	18596	S	1.3	1.4	0:52.99	vmttoolsd
1511	kali	20	0	272316	19068	14808	S	1.0	0.9	1:03.33	wrapper-2.0
18	root	20	0	0	0	0	I	0.7	0.0	0:53.58	rcu_preempt
1509	kali	20	0	296164	25840	15592	S	0.7	1.3	1:43.83	wrapper-2.0
52843	kali	20	0	648892	60736	51316	S	0.7	3.0	0:06.45	qterminal
<b>53480</b>	<b>root</b>	<b>20</b>	<b>0</b>	<b>10472</b>	<b>5628</b>	<b>3580</b>	<b>R</b>	<b>0.7</b>	<b>0.3</b>	<b>0:00.69</b>	<b>top</b>
17	root	20	0	0	0	0	S	0.3	0.0	0:13.53	ksoftirqd/0
590	root	20	0	253140	7004	6492	S	0.3	0.3	1:03.88	vmttoolsd
1514	kali	20	0	285384	20284	16184	S	0.3	1.0	0:04.21	wrapper-2.0
1559	root	20	0	319200	8440	7544	S	0.3	0.4	0:04.25	upowerd
10651	mysql	20	0	1447224	29844	19860	S	0.3	1.5	0:18.01	mariadb
49697	kali	20	0	3137328	456280	212348	S	0.3	22.7	2:03.40	firefox-esr
50855	kali	20	0	2426688	78716	65020	S	0.3	3.9	0:01.54	Web Content
1	root	20	0	24284	11096	7596	S	0.0	0.6	0:19.75	systemd
2	root	20	0	0	0	0	S	0.0	0.0	0:00.49	kthreadd
3	root	20	0	0	0	0	S	0.0	0.0	0:00.00	pool_workqueue_release
4	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	kworker/R-kvfree_rcu_r
5	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	kworker/R-rcu_gp
6	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	kworker/R-sync_wq
7	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	kworker/R-slub_flushwq
8	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	kworker/R-netns
13	root	0	-20	0	0	0	I	0.0	0.0	0:00.14	kworker/R-mm_percpu_wq
14	root	20	0	0	0	0	I	0.0	0.0	0:00.04	rcu_tasks_kthread
15	root	20	0	0	0	0	I	0.0	0.0	0:00.00	rcu_tasks_rude_kthread
16	root	20	0	0	0	0	I	0.0	0.0	0:00.00	rcu_tasks_trace_kthread
19	root	20	0	0	0	0	S	0.0	0.0	0:00.02	rcu_exp_par_gp_kthread
20	root	20	0	0	0	0	S	0.0	0.0	0:00.32	rcu_exp_gp_kthread_wor
21	root	rt	0	0	0	0	S	0.0	0.0	0:01.10	migration/0
22	root	-51	0	0	0	0	S	0.0	0.0	0:00.00	idle_inject/0
23	root	20	0	0	0	0	S	0.0	0.0	0:00.00	cpuhp/0
24	root	20	0	0	0	0	S	0.0	0.0	0:00.00	cpuhp/1
25	root	-51	0	0	0	0	S	0.0	0.0	0:00.00	idle_inject/1
26	root	rt	0	0	0	0	S	0.0	0.0	0:01.55	migration/1
27	root	20	0	0	0	0	S	0.0	0.0	0:06.51	ksoftirqd/1
32	root	20	0	0	0	0	S	0.0	0.0	0:00.01	kdevtmpfs
33	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	kworker/R-inet_frag_wq
34	root	20	0	0	0	0	S	0.0	0.0	0:00.00	kauditd
35	root	20	0	0	0	0	S	0.0	0.0	0:03.32	khungtaskd

- kondisi komputer saat diserang di mana kondisinya akan turun mendekati 0%, menandakan CPU tidak lagi memiliki waktu luang.

```

root@kali: /home/kali
Session Actions Edit View Help
top - 14:44:05 up 11 min, 1 user, load average: 1.84, 1.15, 0.74
Tasks: 216 total, 5 running, 211 sleeping, 0 stopped, 0 zombie
%cpu(s): 47.3 us, 26.5 sy, 0.0 ni, 23.3 id, 0.0 wa, 0.0 hi, 2.9 si, 0.0 st
MiB Mem : 1964.5 total, 522.4 free, 1005.4 used, 793.9 buff/cache
MiB Swap: 953.7 total, 953.7 free, 0.0 used, 959.1 avail Mem

  PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM    TIME+  COMMAND
 1007 root        20   0   373696  123384  61044 R   60.2    6.1   1:58.19 Xorg
 3473 kali       20   0   647128  59780  50216 R   29.9    3.0   0:26.59 qterminal
 6362 root        20   0    9560    5172   4916 R   25.0    0.3   0:16.65 hping3
 1308 kali       20   0   886908  125036  82556 S    6.6    6.2   0:20.20 xfwm4
 6359 root        20   0    22820   8412   7132 S    6.6    0.4   0:02.68 sudo
   12 root        20   0      0      0      0 I    4.3    0.0   0:04.75 kworker/u128:0-events_unbound
 4287 root        20   0   22284   8004   6724 S    4.3    0.4   0:02.36 sudo
 1425 root        20   0   319052  10456   8280 S    3.6    0.5   0:02.31 upowerd
 1367 kali       20   0  296164  47736  20788 S    2.3    2.4   0:14.25 wrapper-2.0
   18 root        20   0      0      0      0 I    1.6    0.0   0:07.03 rcu_preempt
 1467 kali       20   0   586056  43024  34356 S    1.6    2.1   0:12.07 nm-applet
   54 root        20   0      0      0      0 I    1.3    0.0   0:01.72 kworker/u128:3-events_unbound
 160 root        20   0      0      0      0 R    1.3    0.0   0:00.93 kworker/u128:4-events_unbound
 2111 root        20   0   10460    5692   3516 R    1.0    0.3   0:07.25 top
   610 root        20   0  113796   9756   8348 S    0.7    0.5   0:08.17 vmtotlsd
 1369 kali       20   0   272316  28508  21324 S    0.7    1.4   0:08.04 wrapper-2.0
 1871 kali       20   0   647124  59300  49816 S    0.7    2.9   0:07.38 qterminal
   17 root        20   0      0      0      0 S    0.3    0.0   0:01.63 ksoftirqd/0
   27 root        20   0      0      0      0 S    0.3    0.0   0:00.81 ksoftirqd/1
 342 root        20   0      0      0      0 S    0.3    0.0   0:00.45 jbd2/sda1-8
 1368 kali       20   0   485404  26628  19308 S    0.3    1.3   0:02.91 wrapper-2.0
 1485 kali       20   0   374316  44372  33020 S    0.3    2.2   0:09.09 vmtotlsd
    1 root        20   0   24080   14628  10548 S    0.0    0.7   0:07.26 systemd
    2 root        20   0      0      0      0 S    0.0    0.0   0:00.04 kthreadd
    3 root        20   0      0      0      0 S    0.0    0.0   0:00.00 pool_workqueue_release
    4 root        0 -20      0      0      0 I    0.0    0.0   0:00.00 kworker/R-kvfree_rcu_reclaim
    5 root        0 -20      0      0      0 I    0.0    0.0   0:00.00 kworker/R-rcu_gp
    6 root        0 -20      0      0      0 I    0.0    0.0   0:00.00 kworker/R-sync_wq
    7 root        0 -20      0      0      0 I    0.0    0.0   0:00.00 kworker/R-slab_flushwq
    8 root        0 -20      0      0      0 I    0.0    0.0   0:00.00 kworker/R-netns
    9 root        20   0      0      0      0 I    0.0    0.0   0:01.28 kworker/0:0-events
   13 root        0 -20      0      0      0 I    0.0    0.0   0:00.00 kworker/R-mm_percpu_wq
   14 root        20   0      0      0      0 I    0.0    0.0   0:00.00 rcu_tasks_kthreadd
   15 root        20   0      0      0      0 I    0.0    0.0   0:00.00 rcu_tasks_rude_kthreadd
   16 root        20   0      0      0      0 I    0.0    0.0   0:00.00 rcu_tasks_trace_kthreadd
   19 root        20   0      0      0      0 S    0.0    0.0   0:00.00 rcu_exp_par_gp_kthreadd_worker/1

```

## b) Scanning (Terminal 2)

- nmap -p 80 127.0.0.1: Memastikan port 80 (HTTP) terbuka sebelum serangan dimulai.

```

(kali@kali)-[/home/kali]
PS> sudo su
[sudo] password for kali:
(kali@kali)-[/home/kali]
# nmap -p 80 127.0.0.1
Starting Nmap 7.98 ( https://nmap.org ) at 2025-12-29 12:53 -0500
Nmap scan report for localhost (127.0.0.1)
Host is up (0.017s latency).

PORT      STATE SERVICE
80/tcp    open  http

Nmap done: 1 IP address (1 host up) scanned in 1.10 seconds

(kali@kali)-[/home/kali]
#

```

### c) Eksekusi Serangan (Terminal 3)

- `sudo hping3 -S -p 80 -i u10 127.0.0.1` dan untuk menghentikannya klik CTRL + C

```
zsh: corrupt history file /home/kali/.zsh_history
(kali@kali)-[~]
└─$ sudo su
[sudo] password for kali:
(kali@kali)-[~]
└─$ sudo hping3 -S -p 80 -i u10 127.0.0.1
```

```
len=40 ip=127.0.0.1 ttl=64 DF id=0 sport=80 flags=RA seq=53465 win=0 rtt=37.8 ms
len=40 ip=127.0.0.1 ttl=64 DF id=0 sport=80 flags=RA seq=53466 win=0 rtt=37.6 ms
len=40 ip=127.0.0.1 ttl=64 DF id=0 sport=80 flags=RA seq=53467 win=0 rtt=37.4 ms
len=40 ip=127.0.0.1 ttl=64 DF id=0 sport=80 flags=RA seq=53468 win=0 rtt=37.2 ms
len=40 ip=127.0.0.1 ttl=64 DF id=0 sport=80 flags=RA seq=53469 win=0 rtt=36.9 ms
len=40 ip=127.0.0.1 ttl=64 DF id=0 sport=80 flags=RA seq=53470 win=0 rtt=36.8 ms
len=40 ip=127.0.0.1 ttl=64 DF id=0 sport=80 flags=RA seq=53471 win=0 rtt=36.7 ms
len=40 ip=127.0.0.1 ttl=64 DF id=0 sport=80 flags=RA seq=53472 win=0 rtt=5.9 ms
len=40 ip=127.0.0.1 ttl=64 DF id=0 sport=80 flags=RA seq=53473 win=0 rtt=6.1 ms
len=40 ip=127.0.0.1 ttl=64 DF id=0 sport=80 flags=RA seq=53474 win=0 rtt=5.9 ms
len=40 ip=127.0.0.1 ttl=64 DF id=0 sport=80 flags=RA seq=53475 win=0 rtt=5.6 ms
len=40 ip=127.0.0.1 ttl=64 DF id=0 sport=80 flags=RA seq=53476 win=0 rtt=17.7 ms
len=40 ip=127.0.0.1 ttl=64 DF id=0 sport=80 flags=RA seq=53477 win=0 rtt=17.5 ms
len=40 ip=127.0.0.1 ttl=64 DF id=0 sport=80 flags=RA seq=53478 win=0 rtt=17.2 ms
len=40 ip=127.0.0.1 ttl=64 DF id=0 sport=80 flags=RA seq=53479 win=0 rtt=16.9 ms
^C
--- 127.0.0.1 hping statistic ---
53484 packets transmitted, 53480 packets received, 1% packet loss
round-trip min/avg/max = 0.1/23.1/1576.9 ms
```

- ✓ `-S`: Mengirim paket SYN (awal jabat tangan TCP).
- ✓ `-p 80`: Menargetkan port web.
- ✓ `-i u10`: Interval pengiriman paket setiap 10 mikrodetik (sangat cepat).

### 3) Mitigasi (Firewall)

Tahap ini menunjukkan cara menangkal atau membatasi serangan.

#### a) Penerapan Aturan:

- `sudo iptables -A INPUT -p tcp --dport 80 -m limit --limit 25/minute --limit-burst 100 -j ACCEPT`

```
(kali@kali)-[~]
└─$ sudo iptables -A INPUT -p tcp --dport 80 -m limit --limit 25/minute --limit-burst 100 -j ACCEPT
```

- ✓ `-A INPUT`: Menambahkan aturan pada jalur masuk data.
- ✓ `-p tcp --dport 80`: Hanya berlaku untuk protokol TCP di port 80.
- ✓ `-m limit --limit 25/minute`: Membatasi rata-rata hanya 25 paket yang diterima per menit.



- ✓ --limit-burst 100: Mengizinkan lonjakan maksimal hingga 100 paket sebelum pembatasan ketat diberlakukan.

## b) Verifikasi Mitigasi

- `sudo iptables -L -n -v`: Menampilkan daftar aturan firewall beserta jumlah paket (pkts) yang berhasil ditangkap oleh aturan tersebut. Dengan jumlah paket 116 dan total data 4640

```
root@kali: /home/kali
# sudo iptables -L -n -v
Chain INPUT (policy ACCEPT 236K packets, 9431K bytes)
pkts bytes target      prot opt in      out     source      destination
116 4640 ACCEPT      tcp  --  *      *       0.0.0.0/0    0.0.0.0/0    tcp dpt:80 limit: avg 25/min burst 100

Chain FORWARD (policy ACCEPT 0 packets, 0 bytes)
pkts bytes target      prot opt in      out     source      destination

Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
pkts bytes target      prot opt in      out     source      destination
```