

**ITNE2002**  
**Network & Information Security**  
**Project Report**

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## 1. Introduction

In this report, I outline the creation and configuration of a secure network topology using three virtual machines: Kali Linux, Windows 10 and pfSense. These systems connected and positioned in a way so that they mimic a network of an enterprise level. The main reason behind it is that in such environment it is possible to install and try different measures of cybersecurity, starting with the settings of firewall, IDS, and ending with functioning of proxy filter. These tasks include using console to install services for instance Squid, Snort and ClamAV on the Pfense; perform security checks entailing Sweeping detection, port scanning and blacklisting of websites in order to gauge the effectiveness of the network.

That is why this configuration used to show the effectiveness of defensive tools in terms of combating frequent networks threats: Conducting practical security tests and shooting the result is an effective method to deepen the understanding of networks security measures.

## 2. Network Topology Implementation

Simplified topology is deployed in this work in the manner of three systems where each of them plays its own part in the created emulated network environment. The configuration of each of the virtual machine Further, the layout of the network topology is well configured and guarantees the ability to withstand the security challenges. While installing Kali Linux, Windows 10, and pfSense these three operating systems will ensure the creation of an environment to conduct cybersecurity tests safely away from the other operating systems on the computer.

### 2.1. Kali Linux Configuration

Kali Linux was configured with two network interfaces:

- **NAT (Network Address Translation):** This makes the VM to access the internet, and through the DHCP server to be assigned an IP address. The NAT interface serves as the path for Outside connection for software update and remote network benchmarking.
- **intNet (Internal Network):** The second interface of this switch is configured and set with an IP address of 192.168.100.100/24 Subnet Mask 255.255.255.0. This is an internal phase where emulation of attacks through the local network is performed, which targets mainly the Windows 10 VM and the pfSense firewall.

This means that Kali Linux can directly access outside services for updates or other external scanning tools while it can launch internal network attack at the same time without putting the internal network in a vulnerable position of outsiders' attack.

### 2.2. Windows 10 Configuration

Windows 10 was configured similarly, with two network interfaces:

- **intNet (Internal Network):** Another particular interface named internal network interface was manually configured with an IP address of 192.168.100.101/24 which has same subnet as Kali Linux. This will make Windows 10 VM to be on the internal network where it can interact with Kali Linux as well as the pfSense.
- **Proxy Setup:** The proxy for the Windows 10 VM was assigned to be 192.168.100.1/24 of the pfSense. This proxy configuration secures all outbound traffic from Windows 10 to pass through the Squid to do content filtering or blacklisting.

The system used here as the target system with the current state simulating a user device on Windows 10, will help test network attack scenarios and countermeasures completely.

## **2.3. pfSense installation and Configuration**

The main security system of this topology was chosen to be pfSense it is a free open source firewall/router operating system because of its security features that include stateful packet filtering, intrusion, and proxy.

### **Installation steps:**

#### **Download the pfSense ISO:**

We obtained the pfSense installation file from the official website of pfSense. Perhaps, the fact that the ISO file can be used with VirtualBox enabled us to install the firewall using Virtual Machine mode.

#### **Create a Virtual Machine for pfSense:**

- I launched VirtualBox and went to the “New” button where we created a new virtual machine.
- The VM was given the name of ‘pfSense’; for the OS type we tagged it as ‘BSD/FreeBSD ‘64-bit’.
- I provisioned at least 1 GB of RAM and 10 GB of storage to the VM.

#### **Attach the pfSense ISO:**

- In the VM settings, under "Storage," we selected "Controller: thinks is IDE and then attached the downloaded pfSense ISO to installation as a virtual optical disk.

#### **We ensured the VM had two network adapters:**

pfSense, the central element of the topology, was installed with two network interfaces:

- **NAT:** Unlike Kali Linux, this interface serves pfSense to access internet for update and for traffic flow control.
- **intNet (Internal Network):** Another change which was done manually at the internal network interface for IPv4 IP address was 192.168.100.1/24 requirement of subnet mask 255.255.255.0. Being a default connection point for the internal network, pfSense performs firewall state, check IDS and proxy filtering on the traffic between Kali Linux and Windows 10.

Most of the VOIP traffic, internal access, and file sharing is available within internal network and hence pfSense is configured as the internal firewall and router because all the traffic must pass through it and it shall enforce the security measures.

#### **Install pfSense:**

- I turned on the VM and chose to boot from the installed pfSense ISO file.
- Just like any other installation, we followed the installation prompts to install pfSense on the virtual disk that was created.

- After installation, I assigned the interfaces: The second Ethernet type is WAN (connected to NAT) and LAN (connected to the internal network).
- I configured the LAN IP address to static as 192.168.100.1/24.

### **3. Installing Software on pfSense**

Additionally, boosting pfSense even further, the installation and setting up of the following core services has added layers of security such as web filtering, intrusion detection, and the scanning of malware.

#### **3.1. Squid Installation**

Squid is a strong proxy server on pfSense which controls all web connection for internal wired and wireless network. As it was described above, Squid works as an intermediary that blocks some websites according to rules determined by a user. For this project, Squid was made to deny [www.facebook.com](http://www.facebook.com) from the Windows 10 VM.

Installation steps:

1. Go to package manager of pfSense.
2. To do this you need to download (apt-get) available package options then install Squid from this selection.
3. Set Squid to filter web traffic to 192.168.100.101 which is a Windows 10 machine and use filters to block out certain sites.

#### **3.2. Snort Installation**

Snort the powerful IDS software was incorporated into the appliance to aid its capability to detect the network based attacks. One of its abilities is traffic analysis of internal network and informs the user about such matters as ping sweeps or port scanning etc.

Installation steps:

1. Use the command line in pfSense and go to the package manager.
2. Download the Snort package from the package repository to install.
3. Start Snort to analyze the traffic in the internal network 192.168.100.0/24 and to use rules for the indication of dangerous traffic.

#### **3.3. ClamAV Installation**

ClamAV is a free antivirus service that can be implemented as a mail gateway, viruses scanner and more. Upon installation on pfSense, ClamAV scans entrance traffic for malicious contents in addition to the firewall and IDS.

Installation steps:

1. To install ClamAV, go to the package manager of pfSense and download ClamAV.

- Set up all incoming traffic to be automatically scanned so that any attempts to ‘slip through’ the firewalls will be met with an alert that they are infected by a virus.

### **3.4. Firewall Configuration**

With pfSense, firewalls were set to restrict certain kinds of traffics for instance, ICMP traffics from Kali Linux to Windows 10. This gives an opportunity to evaluate firewall performance with regard to denial of communication on the network.

## **4. Executing Tests and Outputs**

The last thing done in the network configuration, and we need to install some software and perform some test to optimize the network security. These tests where done by performing different kind of attacks using Kali Linux and on the other end, pfSense to defend against them.

### **4.1. Ping Sweep Detection Using Snort**

From the Kali Linux, a ping sweep to pfSense and Windows 10 was conducted to determine all active hosts on internal network. Ping sweep was also performed and as expected snort was able to detect it and produce an alert showing that snort does indeed have an intrusion detection ability.

Result: Ping sweep was identified by Snort and there were alerts raised. This proved that Snort can be used to detect network reconnaissance in progress for one, due to the single occurrence.

### **4.2. Blocking Facebook Using Squid**

Squid was set up to deny users in the Windows 10 VM from accessing www.facebook.com. After doing the proxy configuration, anytime I tried accessing Facebook from the Windows machine, I was successfully blocked, this affirmed the fact that the proxy filtering rules where well and alive.

Result: For the Windows 10 VM, the Squid proxy was also configured to block the access to www.facebook.com, which clearly shown that the proxy-base web filtering works efficiently.

### **4.3. Port Scanning with Nmap**

A port scan and OS detection on the Windows 10 VM was conducted with Nmap from the Kali Linux distribution. The following ports were identified as open:

#### **1. Port 80 (HTTP):**

This port shows that there is a web service for the operating system that is Windows 10. Although this is frequent, Web connections using unsegmented HTTP can be vulnerable to numerous techniques such as Man in the Middle Attack (MITM). They advise that either this service be turned off or that it be replaced with HTTPS.

#### **2. Port 135 (RPC):**

Remote Procedure Call is a core process employed by Windows for making procedures that are present in one process available to other processes. But it is frequently used by hackers motivated by possibilities to execute code from a remote environment or perform DDoS attacks.

### **3. Port 139/445 (NetBIOS/SMB):**

They assist Windows to support services for file sharing. SMB and NetBIOS are most often attacked by cybercriminals, using such a hole as EternalBlue, through which the notorious WannaCry virus spread. It is suggested to close these ports or secure them by means of a powerful authentication.

### **4. Port 3389 (RDP):**

Remote Desktop Protocol (RDP) is used for remote accessing the Windows system. That is why it is considered a high risk service if exposed since the service can be targeted with brute force attacks. It is essential to limit the ability to access it and to use a VPN or have a strong authentication type for this service.

Result: All the open ports had been as listed and it had been ensured that the open services had been closed or protected. Nmap scan also proved by showing that desired ports were closed successfully as well as the other extra unnecessary ports were closed.

#### **4.4. Blocking Ping Messages Using pfSense Firewall**

The pfSense firewall was configured to deny Kali Linux to send ping messages to Windows 10. The following result was obtained after the firewall rule was successfully applied, whereby all ping attempts emanating from Kali Linux were successfully dismissed by the firewall thereby affording evidence of the effectiveness of the firewall in deterring network probing.

Result: Packets such as the ICMP (ping) messages from Kali to Windows 10 were prevented showing how firewall works on controlling traffic on the network.

## **5. Conclusion**

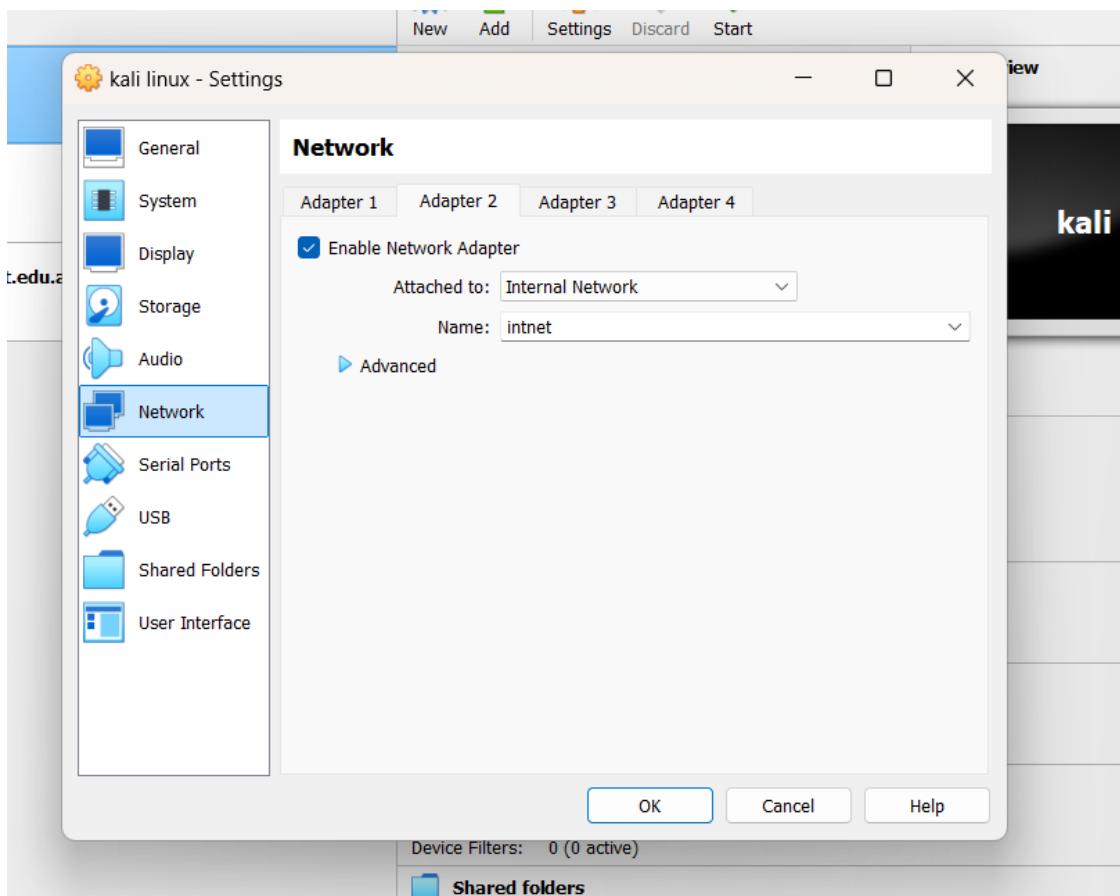
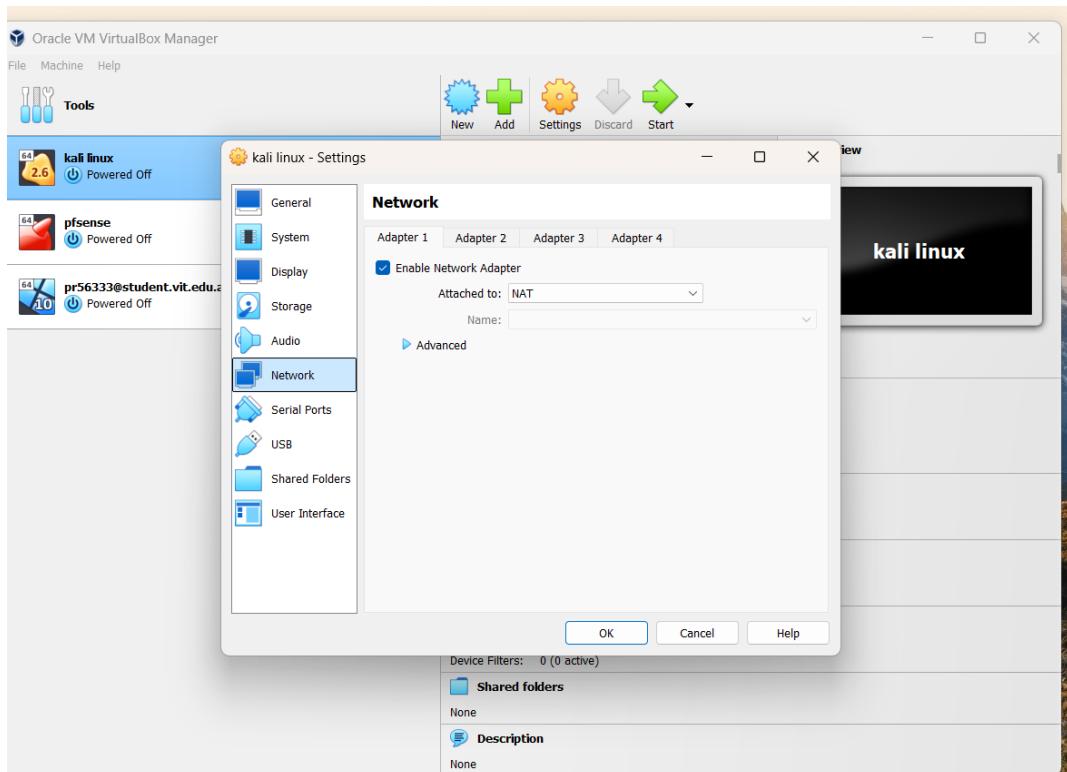
The specifically configured network architecture using the Kali Linux, Windows 10 and pfSense created a perfect environment for assessing the resilience of the networks. That is why, through the use of Squid, Snort, ClamAV, and firewalls settings the network was protected against several sorts of threats. The conducted examinations – ping sweep detection, web traffic filtering, and port scans – showed how well the abovementioned security measures work.

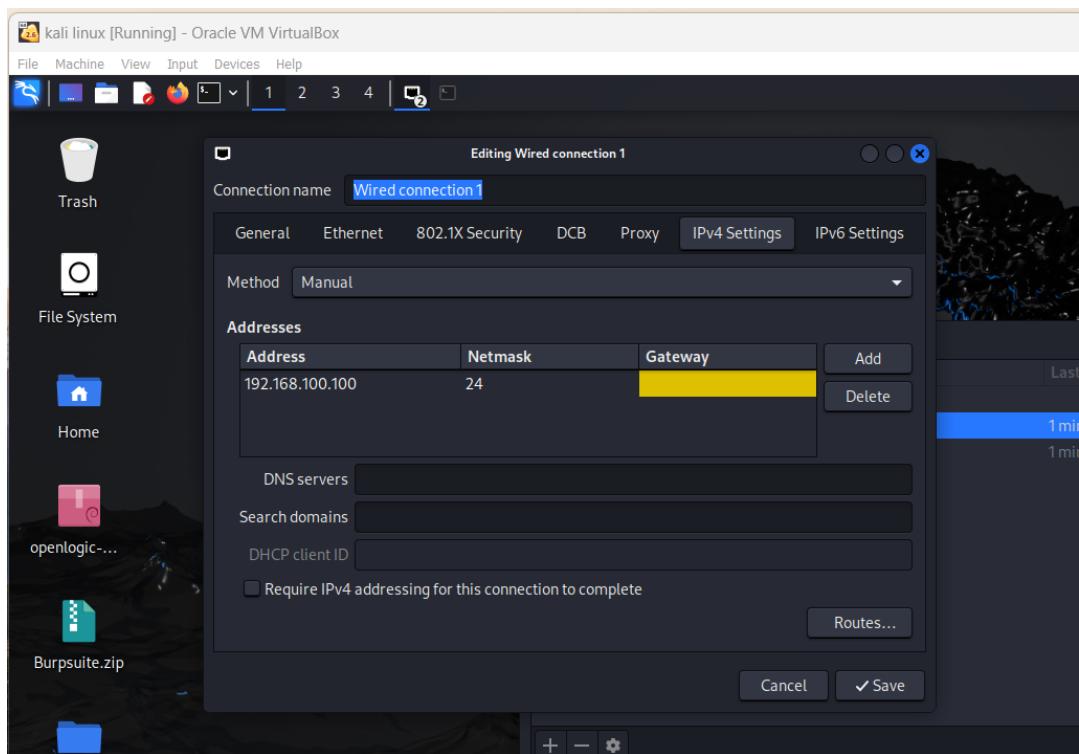
This project raises awareness of the value of different layers in network security since one tool is sufficient to guard against various threats.

## **Screenshots**

# Network Topology

## Kali-Linux





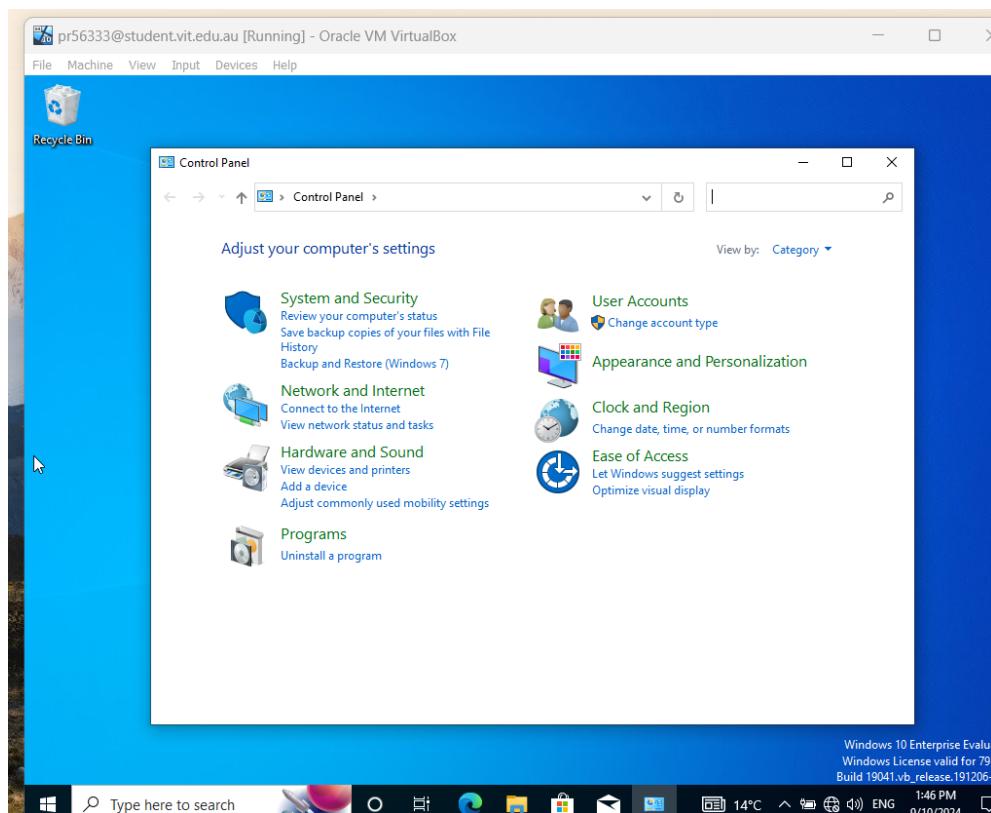
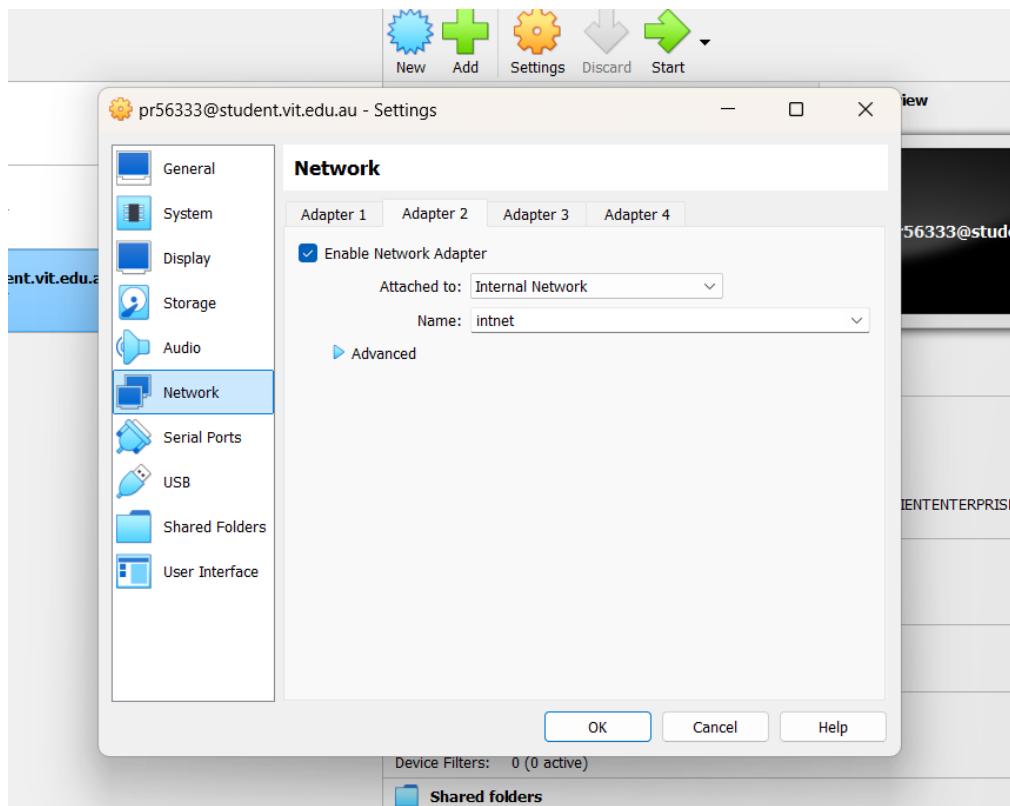
```
File Actions Edit View Help
zsh: corrupt history file /home/pr56333/.zsh_history
(pr56333@kali)-[~]
$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.2.15 netmask 255.255.255.0 broadcast 10.0.2.255
        inet6 fe80::8647:f7e5:2406:55e2 prefixlen 64 scopeid 0x20<link>
            ether 08:00:27:ab:06:2d txqueuelen 1000 (Ethernet)
                RX packets 1 bytes 590 (590.0 B)
                TX packets 24 bytes 3152 (3.0 KiB)
                TX errors 0 dropped 0 overruns 0 frame 0
                TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

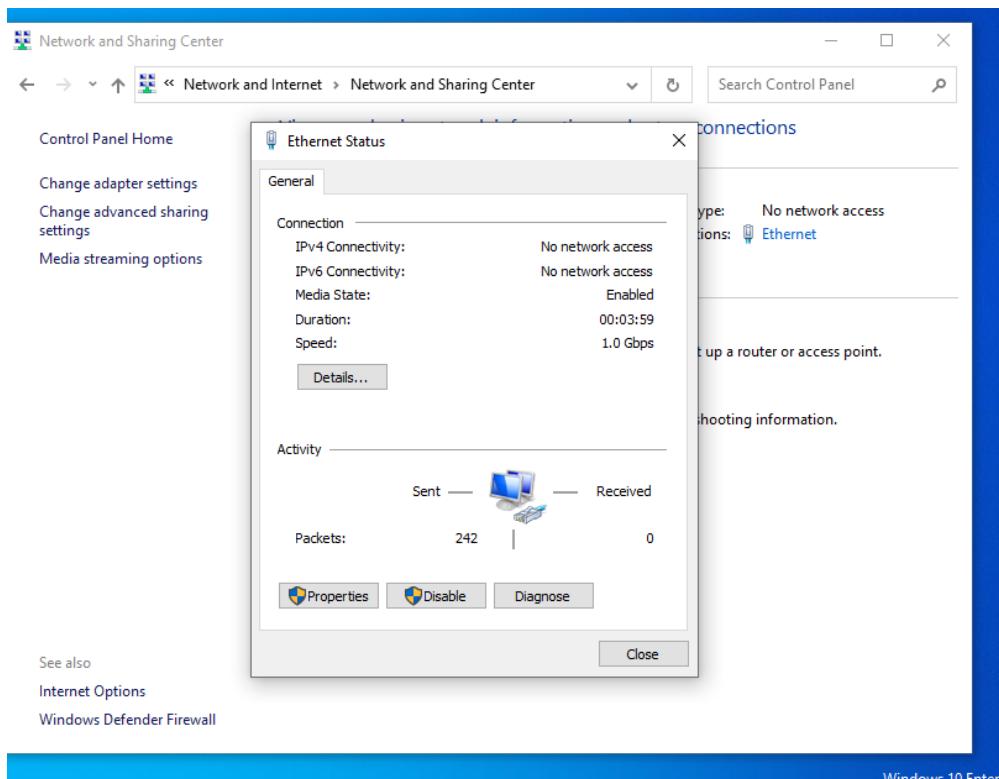
eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.100.100 netmask 255.255.255.0 broadcast 192.168.100.255
        inet6 fe80::e78a:d21e:eb88:4bc9 prefixlen 64 scopeid 0x20<link>
            ether 08:00:27:0d:4e:19 txqueuelen 1000 (Ethernet)
                RX packets 0 bytes 0 (0.0 B)
                RX errors 0 dropped 0 overruns 0 frame 0
                TX packets 23 bytes 2822 (2.7 KiB)
                TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
        inet6 ::1 prefixlen 128 scopeid 0x10<host>
            loop txqueuelen 1000 (Local Loopback)
                RX packets 8 bytes 480 (480.0 B)
                RX errors 0 dropped 0 overruns 0 frame 0
                TX packets 8 bytes 480 (480.0 B)
                TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

(pr56333@kali)-[~]
```

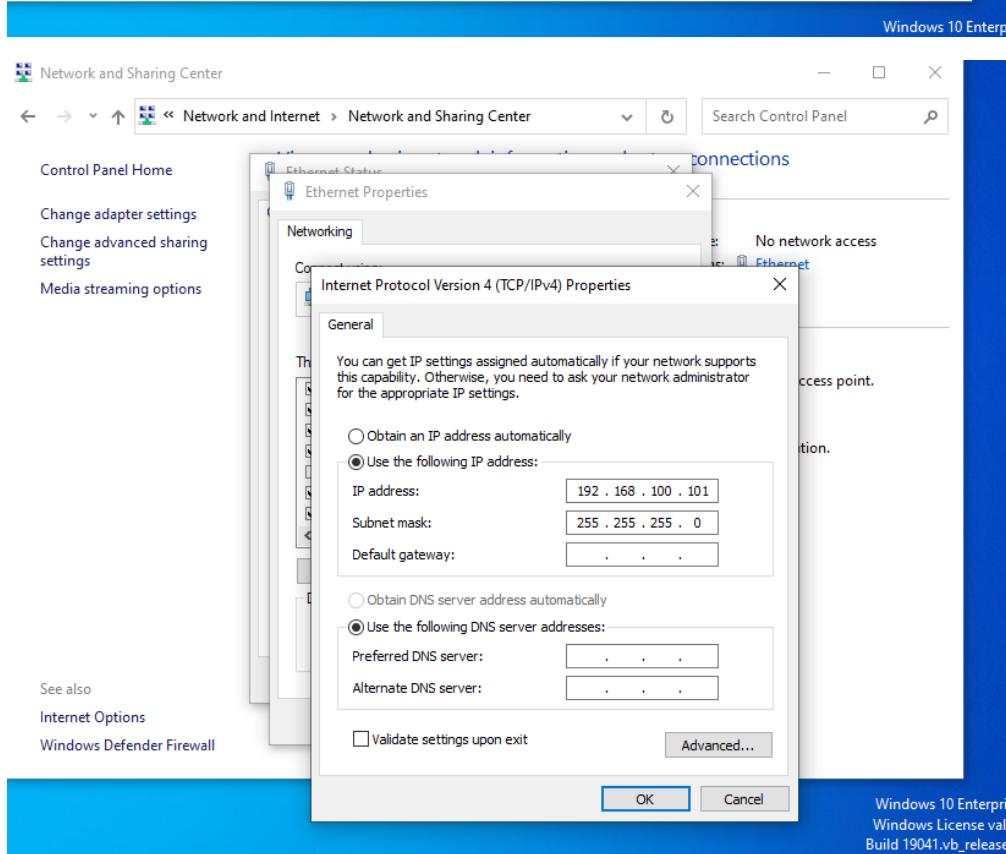
# Windows





See also

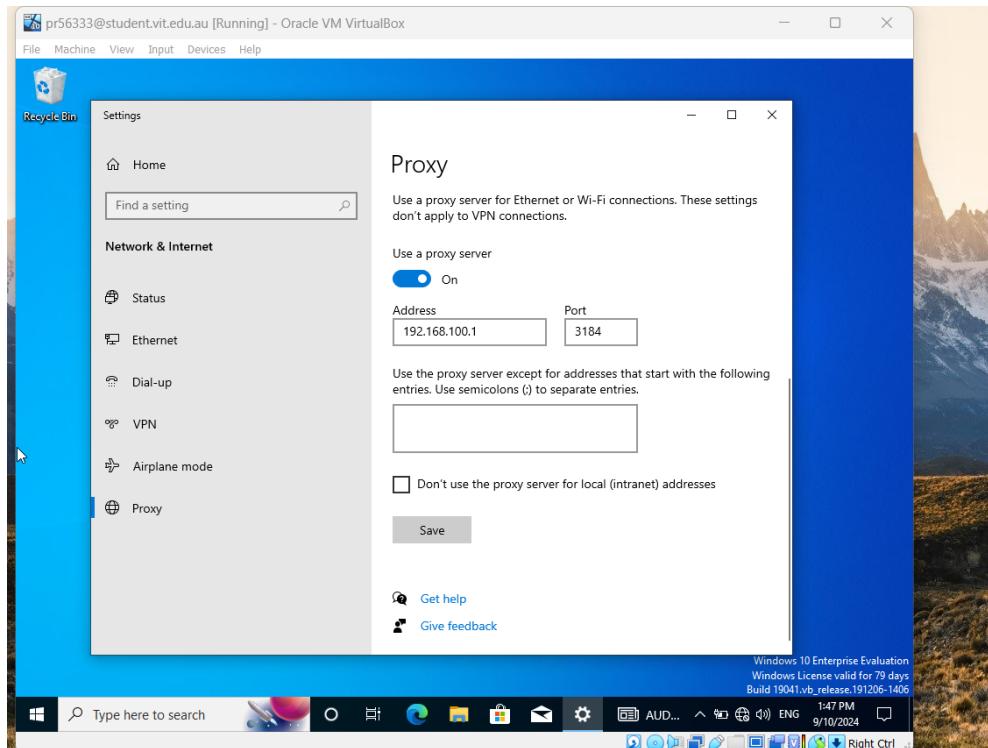
Internet Options  
Windows Defender Firewall



See also

Internet Options  
Windows Defender Firewall

Windows 10 Enterprise  
Windows License valid  
Build 19041.vb\_release



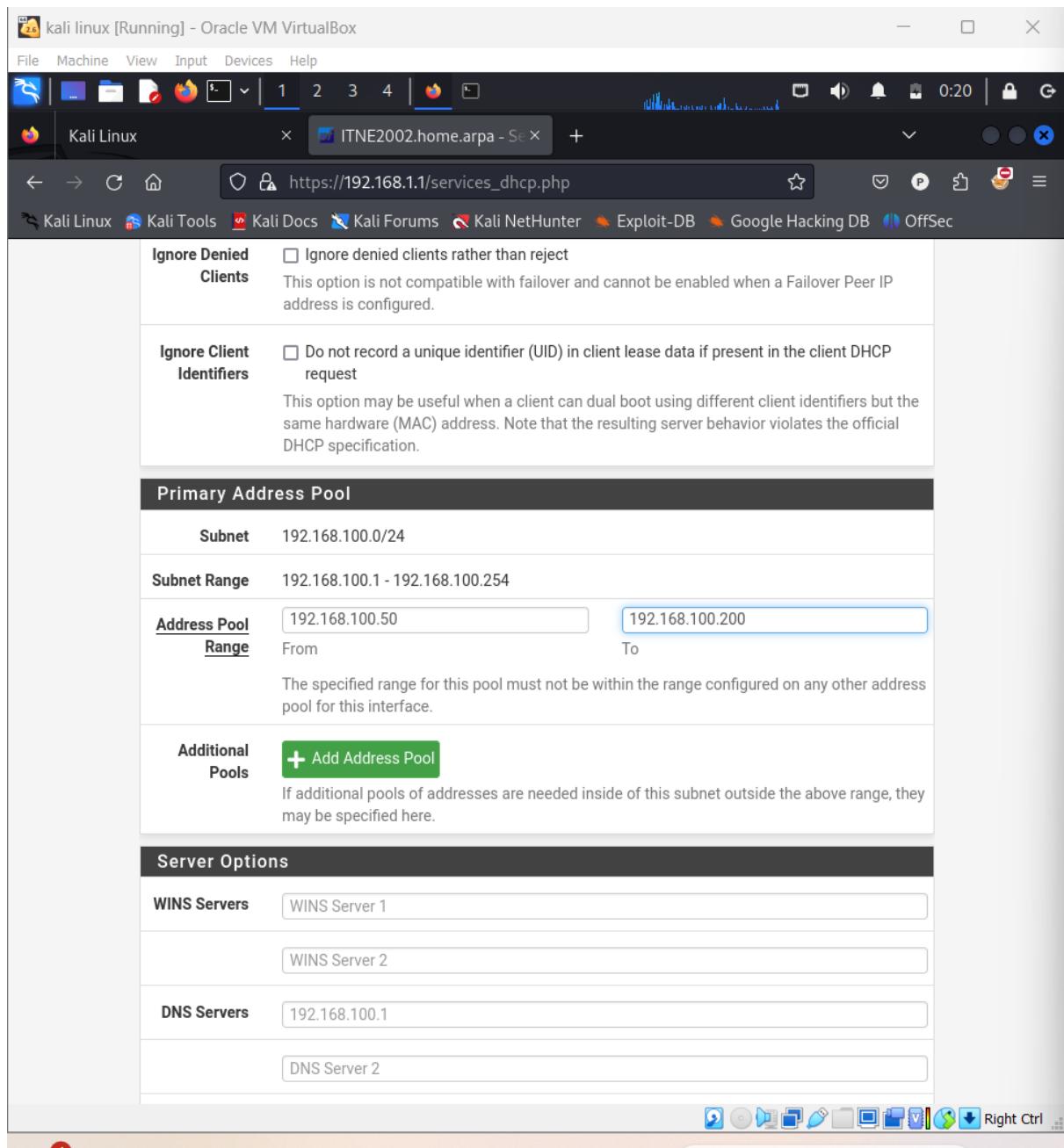
```
Recycle Bin
Command Prompt
Microsoft Windows [Version 10.0.19045.2006]
(c) Microsoft Corporation. All rights reserved.

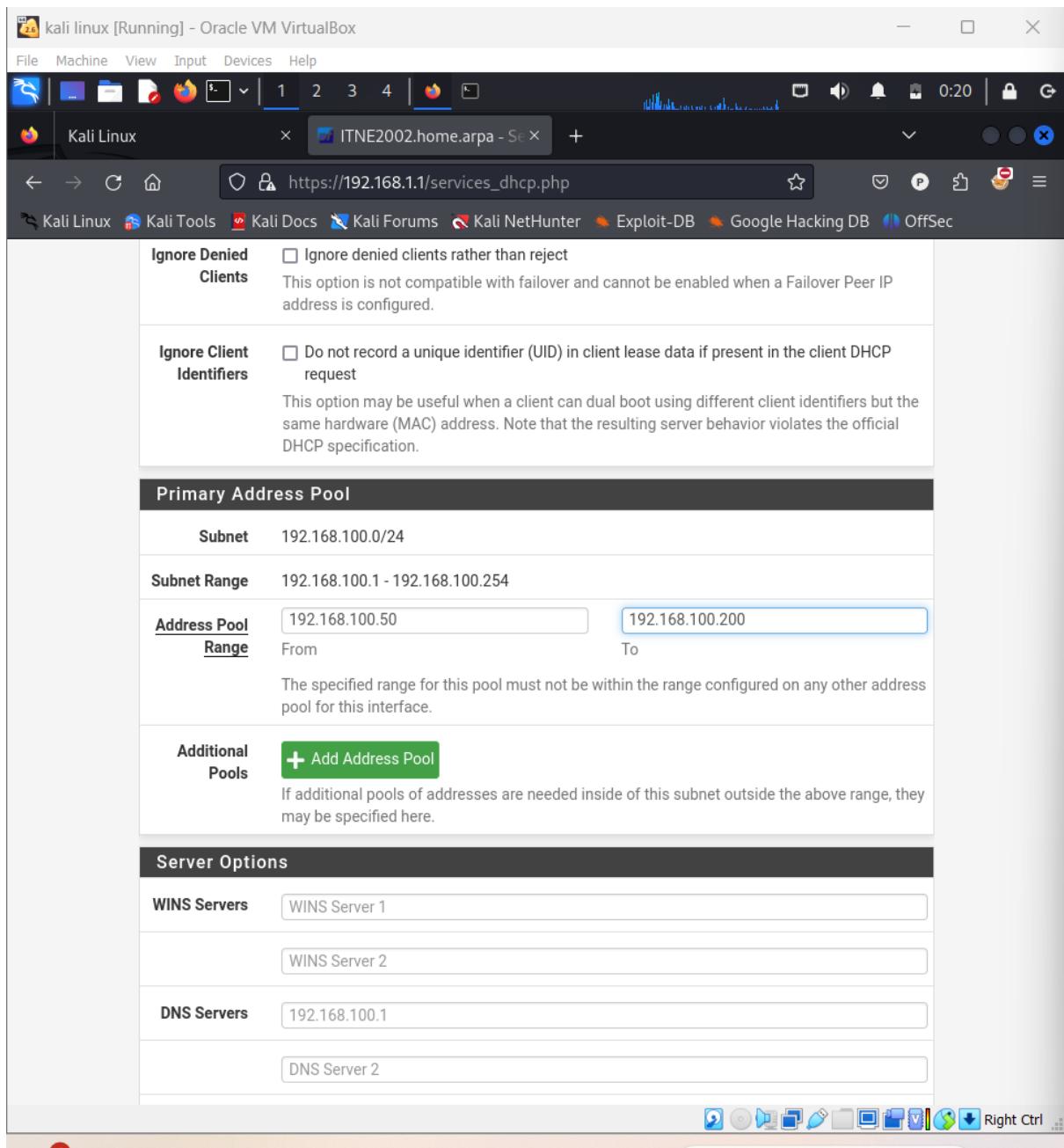
C:\Users\pr56333>ipconfig
Windows IP Configuration

Ethernet adapter Ethernet:

Connection-specific DNS Suffix  . :
Link-local IPv6 Address . . . . . : fe80::cc21:30f7:bdb2:82d9%7
IPv4 Address . . . . . : 192.168.100.101
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . :
```

## Pfsense





kali linux [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Kali Linux ITNE2002.home.apna - In 1 2 3 4 0:17

Kali Linux Kali Tools Kali Docs Kali Forums Kali NetHunter Exploit-DB Google Hacking DB OffSec

**MAC Address** XX:XX:XX:XX:XX:XX  
This field can be used to modify ("spoof") the MAC address of this interface. Enter a MAC address in the following format: xx:xx:xx:xx:xx or leave blank.

**MTU** If this field is blank, the adapter's default MTU will be used. This is typically 1500 bytes but can vary in some circumstances.

**MSS** If a value is entered in this field, then MSS clamping for TCP connections to the value entered above minus 40 for IPv4 (TCP/IPv4 header size) and minus 60 for IPv6 (TCP/IPv6 header size) will be in effect.

**Speed and Duplex** Default (no preference, typically autoselect)  
Explicitly set speed and duplex mode for this interface.  
WARNING: MUST be set to autoselect (automatically negotiate speed) unless the port this interface connects to has its speed and duplex forced.

**Static IPv4 Configuration**

**IPv4 Address** 192.168.100.1 / 24

**IPv4 Upstream gateway** None [+ Add a new gateway](#)

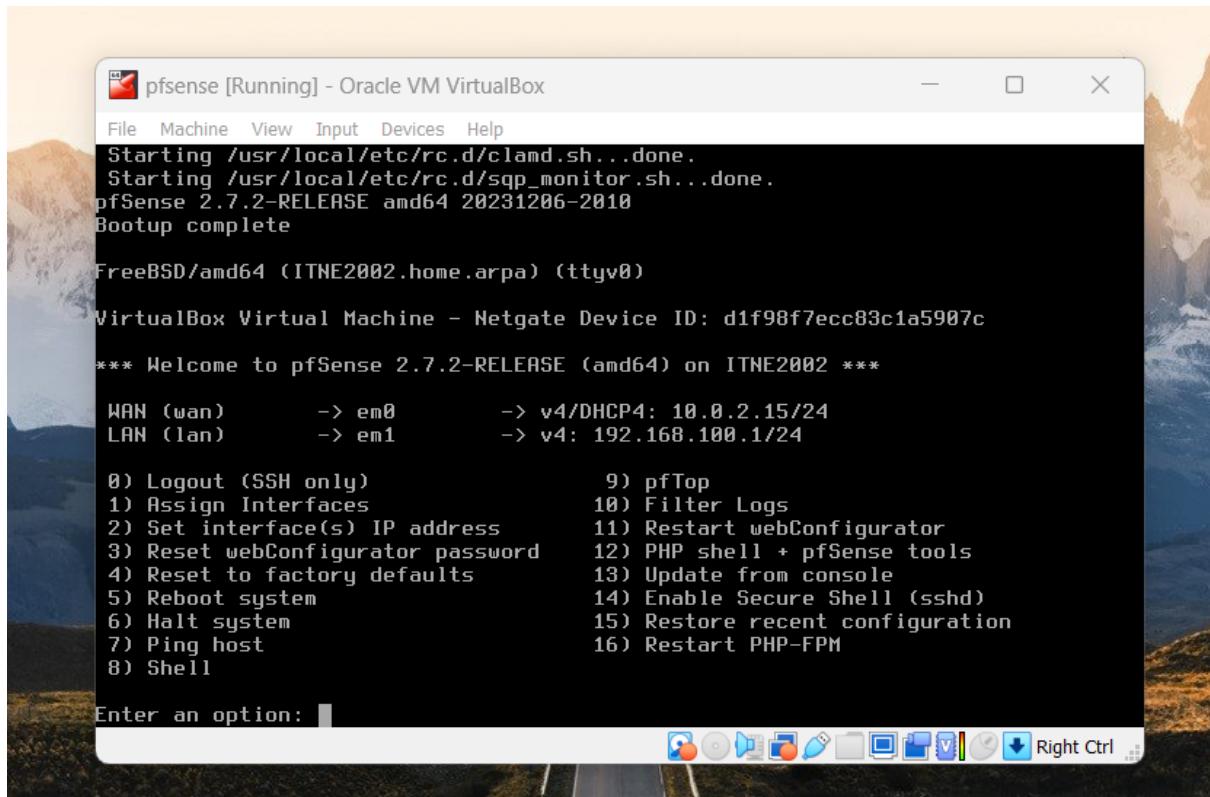
If this interface is an Internet connection, select an existing Gateway from the list or add a new one using the "Add" button.  
On local area network interfaces the upstream gateway should be "none".  
Selecting an upstream gateway causes the firewall to treat this interface as a [WAN type interface](#).  
Gateways can be managed by [clicking here](#).

**Track IPv6 Interface**

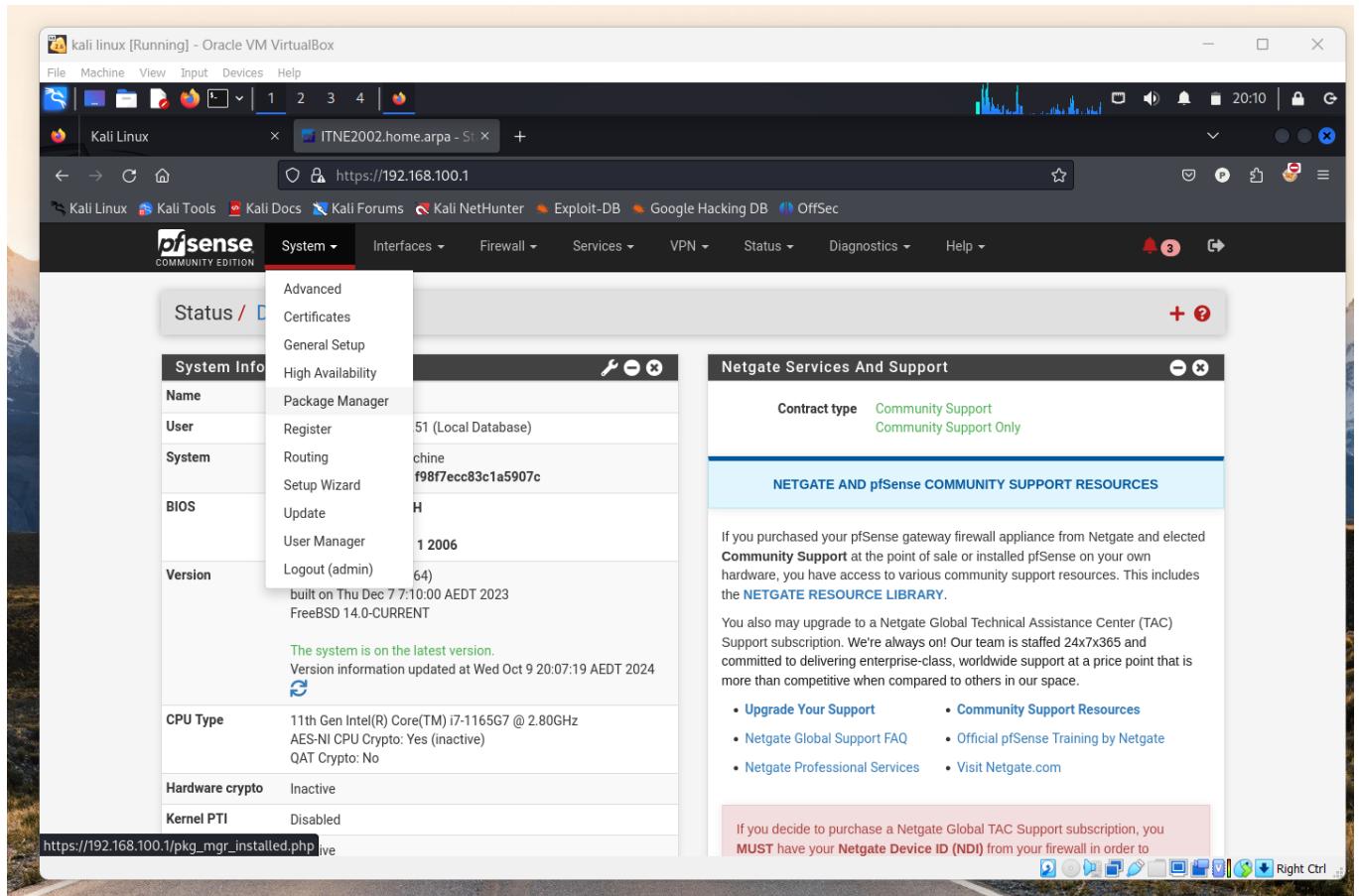
**IPv6 Interface** WAN  
Selects the dynamic IPv6 WAN interface to track for configuration.

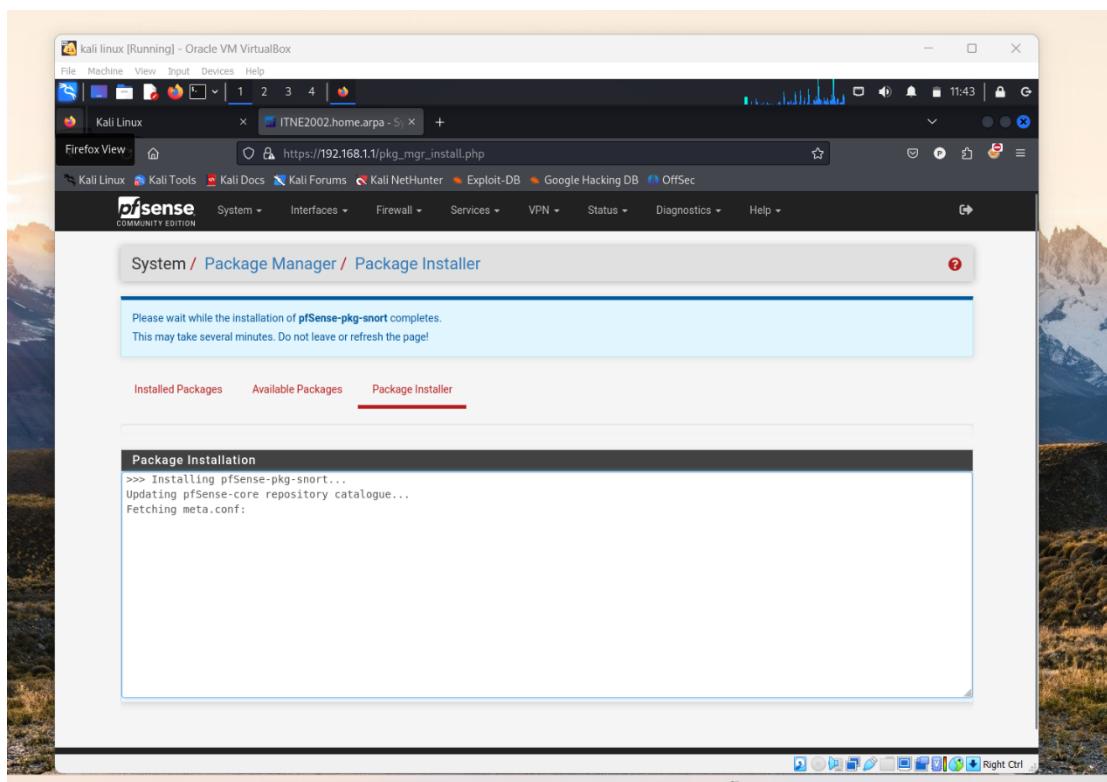
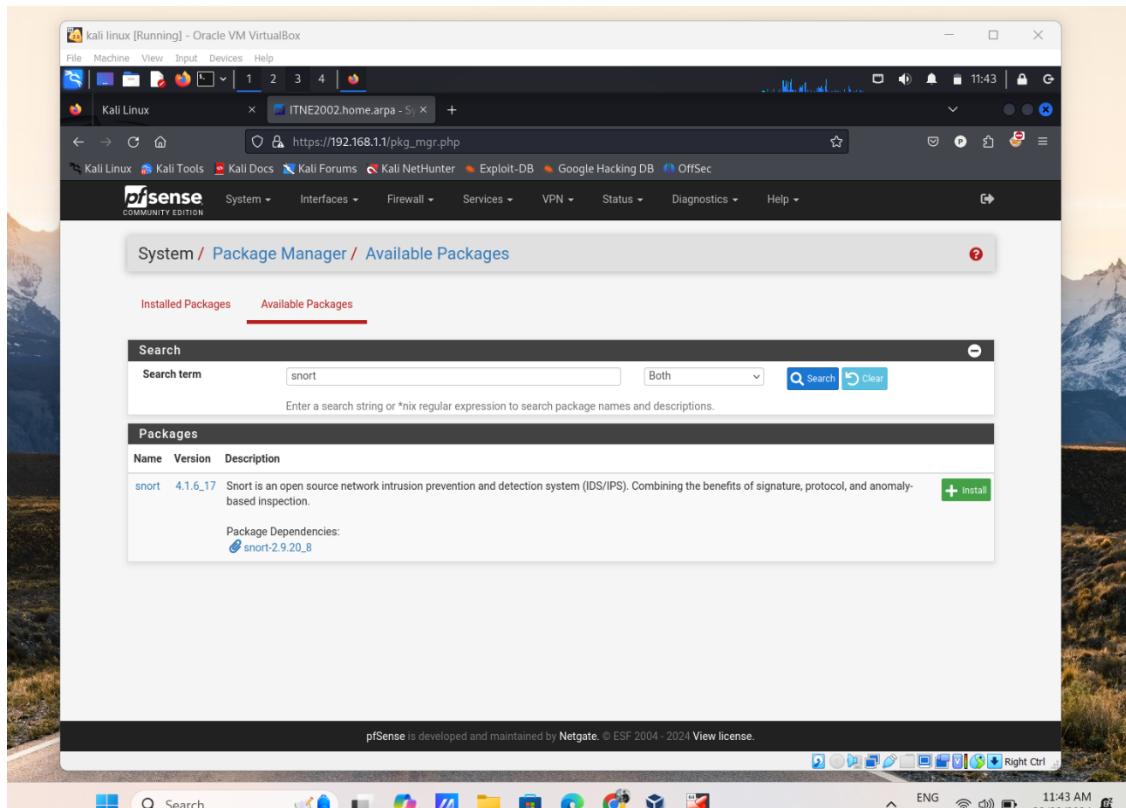
AUD/EUR Right Ctrl

This screenshot shows a configuration window for a network interface in Kali Linux. The top section is titled 'Static IPv4 Configuration' and contains fields for the IP address (192.168.100.1), subnet mask (/24), and upstream gateway (None). It also includes a note about selecting a gateway for an Internet connection. Below this is a 'Track IPv6 Interface' section with a dropdown menu set to 'WAN'. The bottom of the window features a toolbar with various icons and a status bar showing currency exchange rates (AUD/EUR) and keyboard controls (Right Ctrl).



## a. Configure Snort to detect local intrusions and attack the pfSense system through Kali Linux using ping sweep and attach the report.





The screenshot shows the pfSense Global Settings page for Snort. The top navigation bar includes links for Kali Linux, Kali Tools, Kali Docs, Kali Forums, Kali NetHunter, Exploit-DB, Google Hacking DB, and OffSec. Below the navigation is a pfSense logo and a menu with System, Interfaces, Firewall, Services, VPN, Status, Diagnostics, and Help. A notification icon indicates 3 alerts.

The main content area is titled "Services / Snort / Global Settings". The "Global Settings" tab is selected. The page is divided into sections:

- Snort Subscriber Rules**:
  - Enable Snort VRT:  Click to enable download of Snort free Registered User or paid Subscriber rules.
  - Sign Up for a free Registered User Rules Account
  - Sign Up for paid Snort Subscriber Rule Set (by Talos)
- Snort GPLv2 Community Rules**:
  - Enable Snort GPLv2:  Click to enable download of Snort GPLv2 Community rules.
  - The Snort Community Ruleset is a GPLv2 Talos certified ruleset that is distributed free of charge without any Snort Subscriber License restrictions. This ruleset is updated daily and is a subset of the subscriber ruleset.
- Emerging Threats (ET) Rules**:
  - Enable ET Open:  Click to enable download of Emerging Threats Open rules.
  - ETOOpen is an open source set of Snort rules whose coverage is more limited than ETPro.
  - Enable ET Pro:  Click to enable download of Emerging Threats Pro rules.
  - Sign Up for an ETPro Account

At the bottom right of the page are several small icons for file operations like copy, paste, and save.

The screenshot shows the pfSense Snort Interfaces page for LAN Settings. The top navigation bar and pfSense interface are identical to the previous screenshot. The main content area is titled "Services / Snort / Snort Interfaces". The "Snort Interfaces" tab is selected. The page is divided into sections:

- General Settings**:
  - Enable:  Enable interface.
  - Interface: LAN (em1)  
Choose the interface where this Snort instance will inspect traffic.
  - Description: LAN  
Enter a meaningful description here for your reference.
  - Snap Length: 1518  
Enter the desired interface snaplen value in bytes. Default is 1518 and is suitable for most applications.
- Alert Settings**:
  - Send Alerts to System Log:  Snort will send Alerts to the firewall's system log. Default is Not Checked.
  - Enable Packet Captures:  Checking this option will automatically capture packets that generate a Snort alert into a tcpdump compatible file.
  - Enable Unified2 Logging:  Checking this option will cause Snort to simultaneously log alerts to a unified2 binary format log file in the logging subdirectory for this interface. Default is Not Checked.

At the bottom right of the page are several small icons for file operations like copy, paste, and save.

**Automatic Flowbit Resolution**

**Resolve Flowbits**  If checked, Snort will auto-enable rules required for checked flowbits. Default is Checked.  
Snort will examine the enabled rules in your chosen rule categories for checked flowbits. Any rules that set these dependent flowbits will be automatically enabled and added to the list of files in the interface rules directory.

**Select the rulesets (Categories) Snort will load at startup**

- Category is auto-enabled by SID Mgmt conf files
- Category is auto-disabled by SID Mgmt conf files

**Enable**

Ruleset: Snort GPLv2 Community Rules
<input checked="" type="checkbox"/> Snort GPLv2 Community Rules (Talos certified)

**Enable**

Ruleset: ET Open Rules	Snort Subscriber rules are not enabled.	Snort OPENAPPID rules are not enabled.
<input checked="" type="checkbox"/> emerging-activex.rules		
<input checked="" type="checkbox"/> emerproto-attack_response.rules		

A change has been made to a rule state.  
Click APPLY when finished to send the changes to the running configuration.

**Available Rule Categories**

Category Selection: **GPLv2\_community.rules**

Select the rule category to view and manage.

**Rule Signature ID (SID) Enable/Disable Overrides**

SID Actions      Enable All

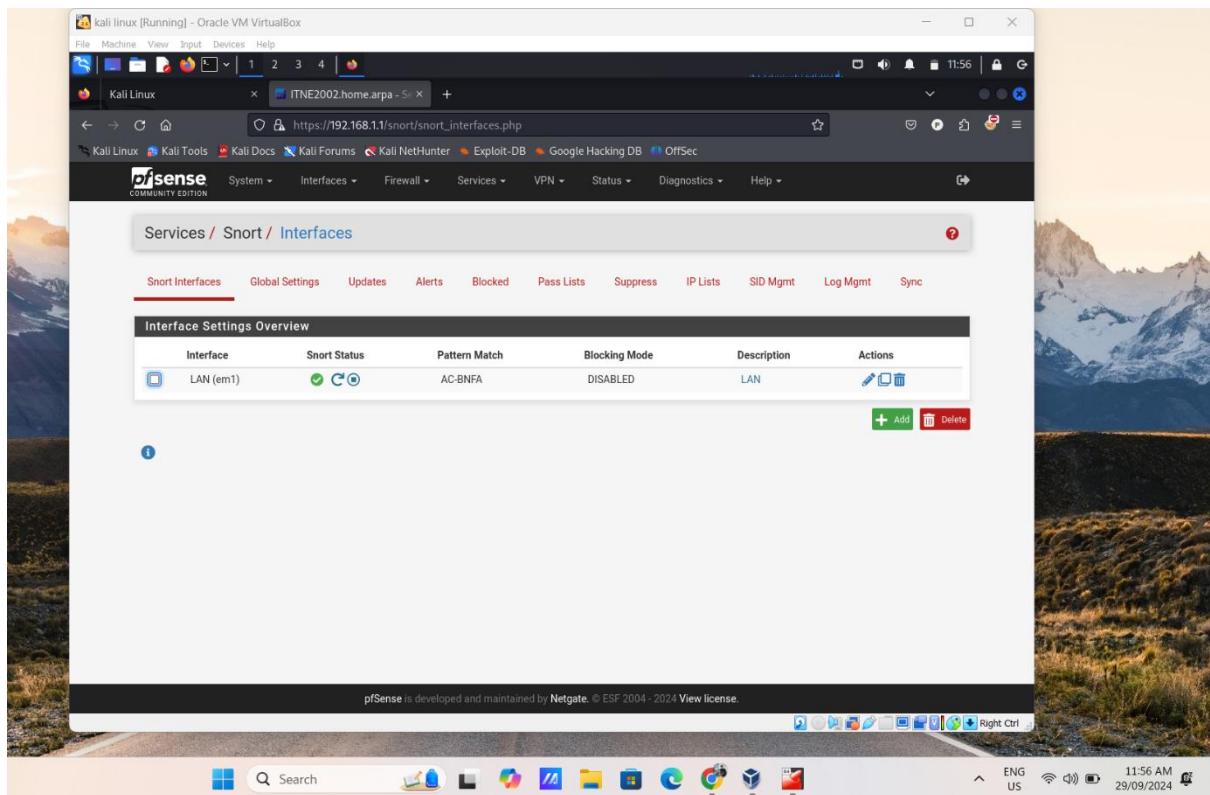
When finished, click APPLY to save and send any SID enable/disable changes made on this tab to Snort.

**Rules View Filter**

**Selected Category's Rules**

Legend:

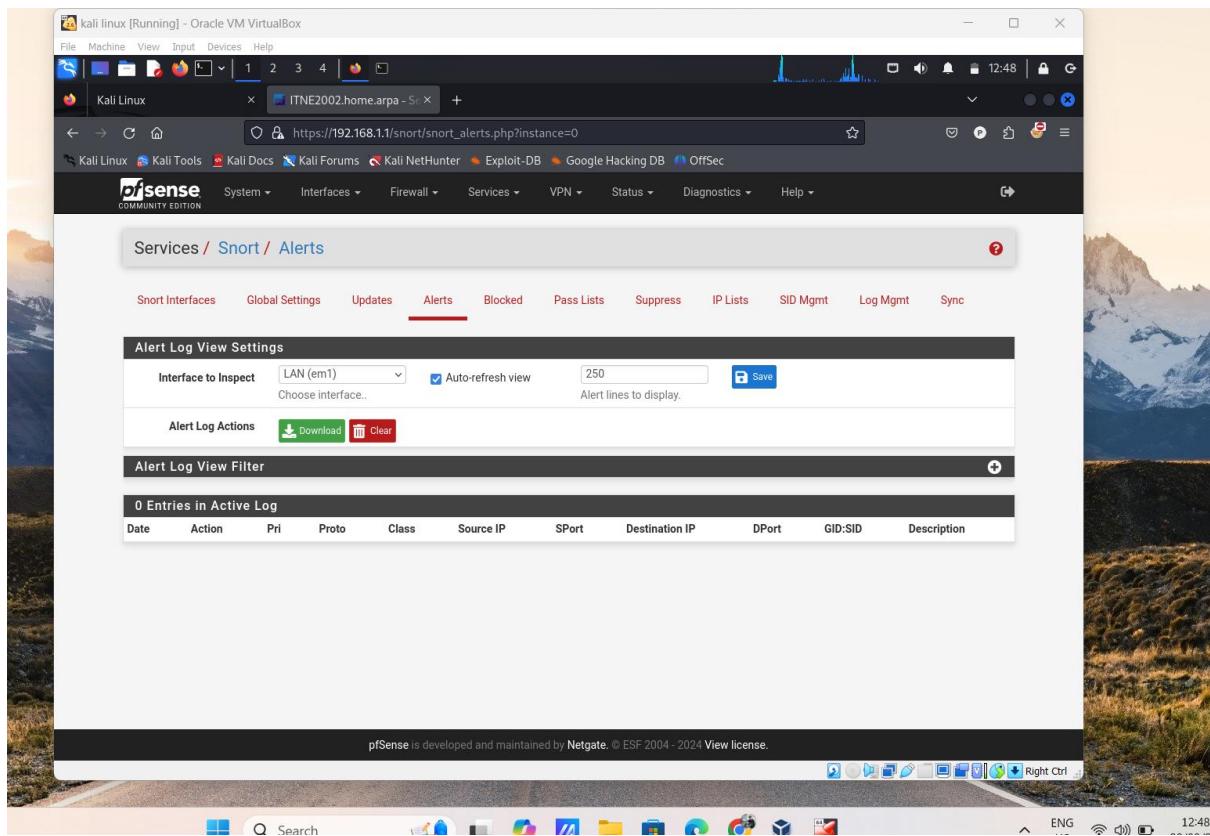
- Default Enabled
- Enabled by user
- Auto-enabled by SID Mgmt
- Action/content modified by SID Mgmt
- Rule action is alert
- Default Disabled
- Disabled by user
- Auto-disabled by SID Mgmt



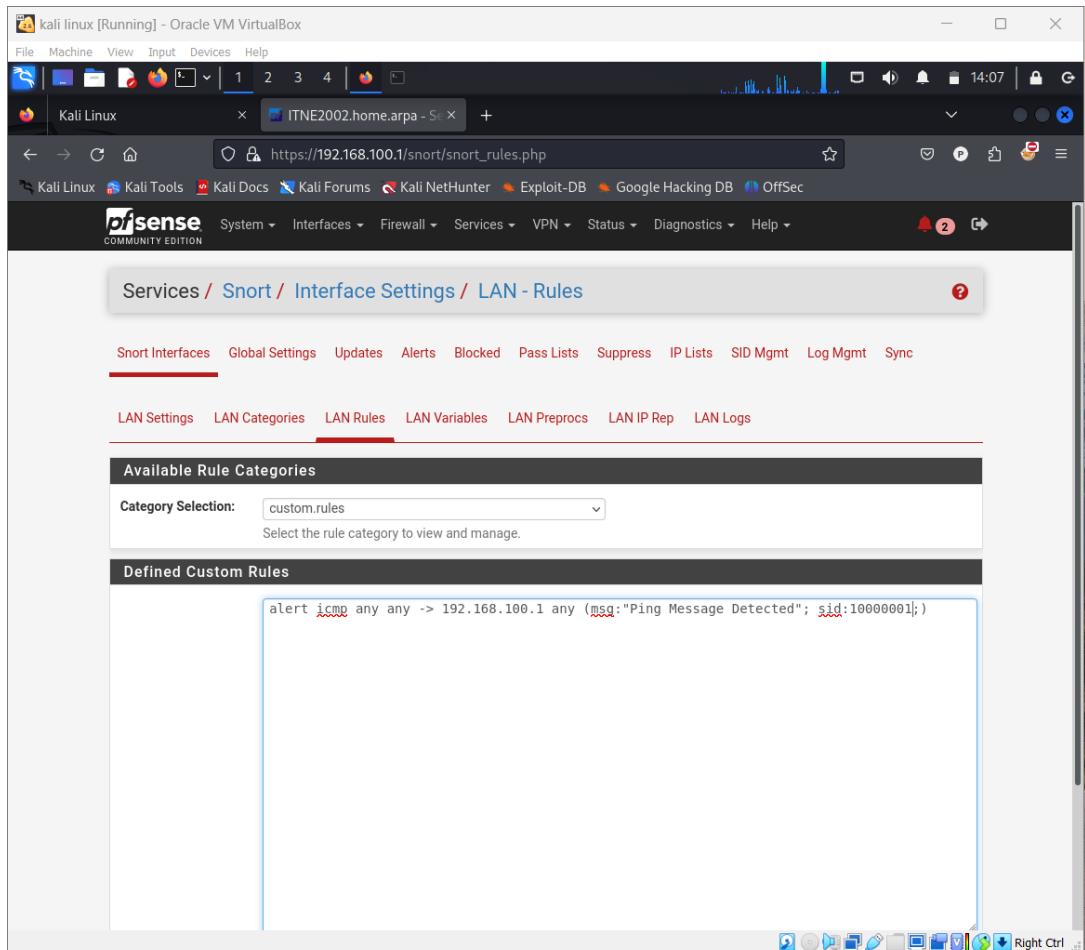
The screenshot shows the pfSense web interface for managing Snort interfaces. The URL is [https://192.168.1.1/snort/snort\\_interfaces.php](https://192.168.1.1/snort/snort_interfaces.php). The main title is "Services / Snort / Interfaces". The "Snort Interfaces" tab is selected. A table titled "Interface Settings Overview" lists one interface:

Interface	Snort Status	Pattern Match	Blocking Mode	Description	Actions
LAN (em1)	Green circle with checkmark	AC-BNFA	DISABLED	LAN	<a href="#">Edit</a> <a href="#">Delete</a>

Below the table are "Add" and "Delete" buttons. The pfSense footer at the bottom states: "pfSense is developed and maintained by Netgate. © ESF 2004 - 2024 View license." The desktop taskbar at the bottom includes icons for File Explorer, Edge, and various system status indicators.



The screenshot shows the pfSense web interface for managing Snort alerts. The URL is [https://192.168.1.1/snort/snort\\_alerts.php?instance=0](https://192.168.1.1/snort/snort_alerts.php?instance=0). The main title is "Services / Snort / Alerts". The "Alerts" tab is selected. The page includes "Alert Log View Settings" and "Alert Log Actions" sections, and an "Alert Log View Filter" section showing "0 Entries in Active Log". The pfSense footer at the bottom states: "pfSense is developed and maintained by Netgate. © ESF 2004 - 2024 View license." The desktop taskbar at the bottom includes icons for File Explorer, Edge, and various system status indicators.



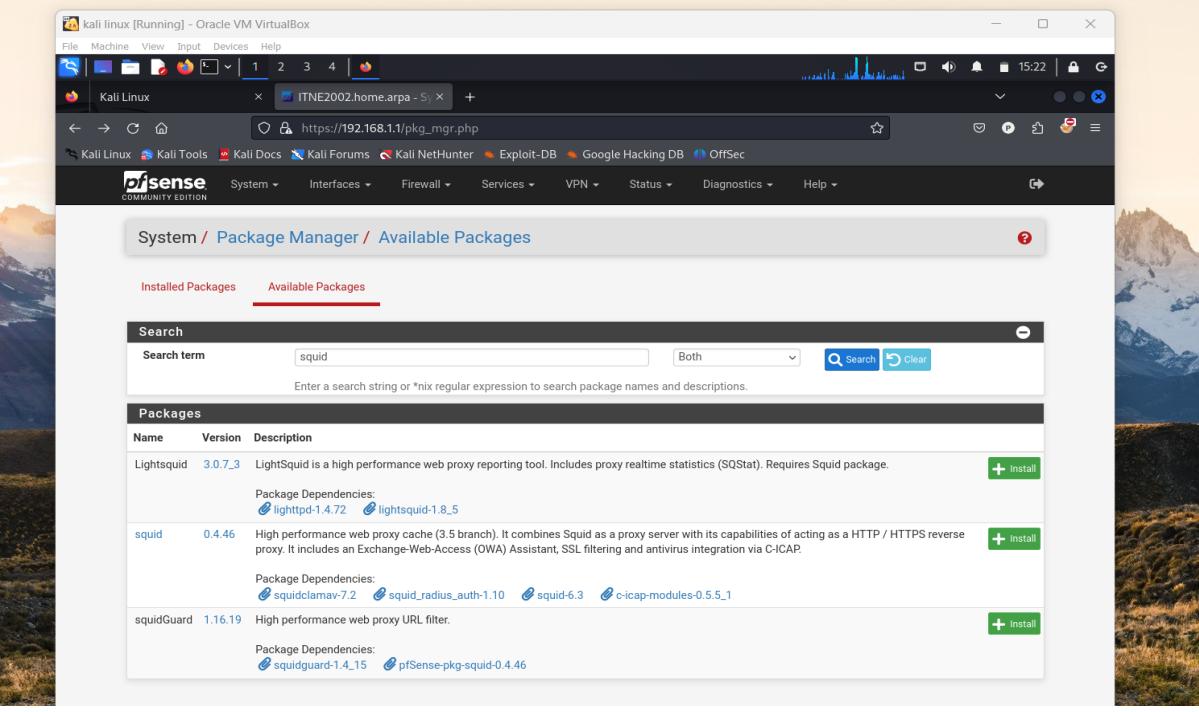
```
Nmap done: 256 IP addresses (3 hosts up) scanned in 1.80 seconds
Interface to Inspect: LAN (em1) Auto-refresh: 250
(pr56333㉿kali)-[~]
$ ping 192.168.100.1
PING 192.168.100.1 (192.168.100.1) 56(84) bytes of data.
64 bytes from 192.168.100.1: icmp_seq=1 ttl=64 time=0.817 ms
64 bytes from 192.168.100.1: icmp_seq=2 ttl=64 time=0.426 ms
64 bytes from 192.168.100.1: icmp_seq=3 ttl=64 time=0.758 ms
64 bytes from 192.168.100.1: icmp_seq=4 ttl=64 time=0.664 ms
64 bytes from 192.168.100.1: icmp_seq=5 ttl=64 time=0.562 ms
64 bytes from 192.168.100.1: icmp_seq=6 ttl=64 time=0.352 ms
64 bytes from 192.168.100.1: icmp_seq=7 ttl=64 time=0.515 ms
64 bytes from 192.168.100.1: icmp_seq=8 ttl=64 time=0.612 ms
64 bytes from 192.168.100.1: icmp_seq=9 ttl=64 time=0.930 ms
64 bytes from 192.168.100.1: icmp_seq=10 ttl=64 time=0.950 ms
64 bytes from 192.168.100.1: icmp_seq=11 ttl=64 time=1.30 ms
64 bytes from 192.168.100.1: icmp_seq=12 ttl=64 time=1.07 ms
64 bytes from 192.168.100.1: icmp_seq=13 ttl=64 time=1.08 ms
64 bytes from 192.168.100.1: icmp_seq=14 ttl=64 time=0.542 ms
64 bytes from 192.168.100.1: icmp_seq=15 ttl=64 time=0.586 ms
64 bytes from 192.168.100.1: icmp_seq=16 ttl=64 time=0.511 ms
64 bytes from 192.168.100.1: icmp_seq=17 ttl=64 time=0.532 ms
64 bytes from 192.168.100.1: icmp_seq=18 ttl=64 time=0.589 ms
64 bytes from 192.168.100.1: icmp_seq=19 ttl=64 time=0.475 ms
64 bytes from 192.168.100.1: icmp_seq=20 ttl=64 time=0.569 ms
64 bytes from 192.168.100.1: icmp_seq=21 ttl=64 time=0.801 ms
64 bytes from 192.168.100.1: icmp_seq=22 ttl=64 time=0.940 ms
64 bytes from 192.168.100.1: icmp_seq=23 ttl=64 time=0.596 ms
64 bytes from 192.168.100.1: icmp_seq=24 ttl=64 time=0.628 ms
64 bytes from 192.168.100.1: icmp_seq=25 ttl=64 time=0.620 ms
64 bytes from 192.168.100.1: icmp_seq=26 ttl=64 time=0.179 ms
64 bytes from 192.168.100.1: icmp_seq=27 ttl=64 time=0.425 ms
```

The screenshot shows a Kali Linux desktop environment within Oracle VM VirtualBox. A Firefox browser window is open, displaying the URL [https://192.168.100.1/snort/snort\\_alerts.php?instance=0](https://192.168.100.1/snort/snort_alerts.php?instance=0). The page is titled "Services / Snort / Alerts". The "Alerts" tab is selected. At the top, there is an "Alert Log View Settings" section with a dropdown for "Interface to Inspect" set to "LAN (em1)", a checkbox for "Auto-refresh view" checked, a "250" input field for "Alert lines to display", and a "Save" button. Below this is an "Alert Log Actions" section with "Download" and "Clear" buttons. The main area is titled "Alert Log View Filter" and contains a table titled "Most Recent 250 Entries from Active Log". The table has columns: Date, Action, Pri, Proto, Class, Source IP, SPort, Destination IP, DPort, GID:SID, and Description. The data in the table is as follows:

Date	Action	Pri	Proto	Class	Source IP	SPort	Destination IP	DPort	GID:SID	Description
2024-10-09 14:11:26	⚠️	0	ICMP		192.168.100.100	Q +	192.168.100.1	Q +	1:10000001	Ping Message Detected
2024-10-09 14:11:25	⚠️	0	ICMP		192.168.100.100	Q +	192.168.100.1	Q +	1:10000001	Ping Message Detected
2024-10-09 14:11:24	⚠️	0	ICMP		192.168.100.100	Q +	192.168.100.1	Q +	1:10000001	Ping Message Detected
2024-10-09 14:11:23	⚠️	0	ICMP		192.168.100.100	Q +	192.168.100.1	Q +	1:10000001	Ping Message Detected
2024-10-09 14:11:22	⚠️	0	ICMP		192.168.100.100	Q +	192.168.100.1	Q +	1:10000001	Ping Message Detected
2024-10-09 14:11:21	⚠️	0	ICMP		192.168.100.100	O +	192.168.100.1	O +	1:10000001	Ping Message Detected

At the bottom right of the alert log table, there is a toolbar with various icons for file operations.

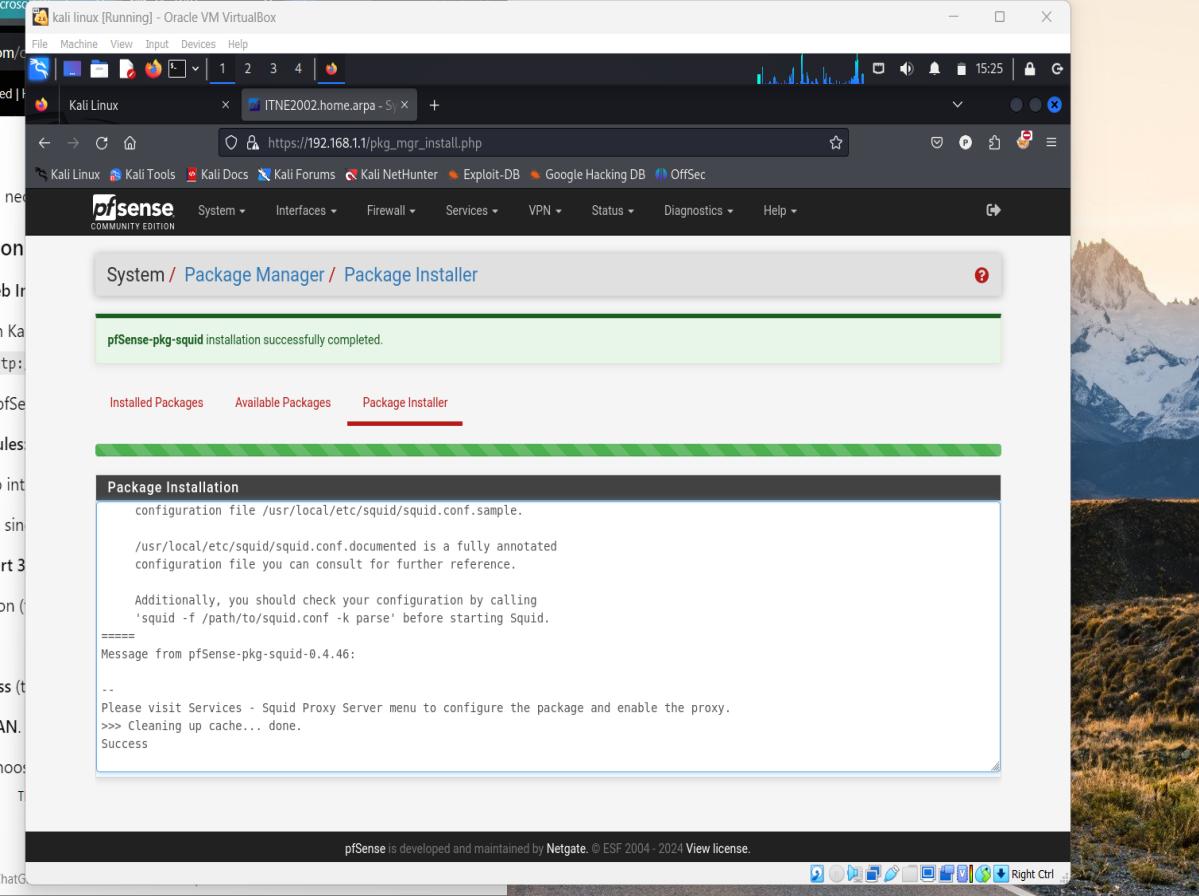
**b. Use Squid to block (blacklist) www.facebook.com and attempt to access Facebook from the Windows 10 VM. Attach the output of the Windows.**



The screenshot shows the pfSense Package Manager interface. The search term 'squid' is entered in the search bar. Three packages are listed:

- Lightsquid** 3.0.7.3: LightSquid is a high performance web proxy reporting tool. Includes proxy realtime statistics (SQStat). Requires Squid package. [+ Install](#)
- squid** 0.4.46: High performance web proxy cache (3.5 branch). It combines Squid as a proxy server with its capabilities of acting as a HTTP / HTTPS reverse proxy. It includes an Exchange-Web-Access (OWA) Assistant, SSL filtering and antivirus integration via C-ICAP. [+ Install](#)
- squidGuard** 1.16.19: High performance web proxy URL filter. [+ Install](#)

Below the packages, there is a note about package dependencies for squidGuard.



The screenshot shows the pfSense Package Manager interface with a success message: "pfSense-pkg-squid installation successfully completed." Below the message, the configuration file path is listed: "/usr/local/etc/squid/squid.conf.sample". A note says: "/usr/local/etc/squid/squid.conf.sample is a fully annotated configuration file you can consult for further reference." Another note says: "Additionally, you should check your configuration by calling 'squid -f /path/to/squid.conf -k parse' before starting Squid." The message concludes with: "Message from pfSense-pkg-squid-0.4.46: -- Please visit Services - Squid Proxy Server menu to configure the package and enable the proxy. >>> Cleaning up cache... done. Success".

The screenshot shows the pfSense web interface for managing a Squid proxy. The URL is [https://192.168.100.1/pkg\\_edit.php?xml=squid.xml&id=0](https://192.168.100.1/pkg_edit.php?xml=squid.xml&id=0). The page title is "Package / Proxy Server: General Settings / General". The "General" tab is selected. The configuration includes:

- Enable Squid Proxy:** Checked (checkbox checked). **Important:** If unchecked, ALL Squid services will be disabled and stopped.
- Keep Settings/Data:** Checked (checkbox checked). **Important:** If disabled, all settings and data will be wiped on package uninstall/reinstall/upgrade.
- Listen IP Version:** IPv4 (dropdown selected).
- CARP Status VIP:** none (dropdown selected). **Important:** Used to determine the HA MASTER/BACKUP status. Squid will be stopped when the chosen VIP is in BACKUP status, and started in MASTER status. **Important:** Don't forget to generate Local Cache on the secondary node and configure XMLRPC Sync for the settings synchronization.
- Proxy Interface(s):** WAN, LAN, loopback (checkboxes selected). **Important:** The interface(s) the proxy server will bind to. Use CTRL + click to select multiple interfaces.
- Outgoing Network Interface:** Default (auto) (dropdown selected).
- Proxy Port:** 3128 (text input field).

The screenshot shows the pfSense web interface for managing Squid Access Control Lists. The URL is [https://192.168.100.1/pkg\\_edit.php?xml=squid\\_nac.xml&id=0](https://192.168.100.1/pkg_edit.php?xml=squid_nac.xml&id=0). The page title is "Package / Proxy Server: Access Control / ACLs". The "ACLs" tab is selected. The configuration includes:

- Allowed Subnets:** A text area for entering subnets in CIDR format. **Important:** Enter subnets that are allowed to use the proxy in CIDR format. All the other subnets won't be able to use the proxy. Put each entry on a separate line. **Important:** When 'Allow Users on Interface' is checked on 'General' tab, there is no need to add the 'Proxy Interface(s)' subnet(s) to this list.
- Unrestricted IPs:** A text area for entering unrestricted IP address(es) / network(s) in CIDR format. Configured entries will NOT be filtered out by the other access control directives set in this page. **Important:** Put each entry on a separate line.
- Banned Hosts Addresses:** A text area for entering banned IP address(es) / network(s) in CIDR format. Configured entries will NOT be allowed to use the proxy.

kali linux [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Kali Linux ITNE2002.home.arpa - P.

1 2 3 4

14:17

16°C ENG 9/10/2024

Kali Linux Kali Tools Kali Docs Kali Forums Kali NetHunter Exploit-DB Google Hacking DB OffSec

Enter IP address(es) / network(s) in CIDR format. Configured entries will NOT be allowed to use the proxy.  
Put each entry on a separate line.

Whitelist

Destination domains that will be accessible to the users that are allowed to use the proxy.  
Put each entry on a separate line. You can also use regular expressions.

Blacklist `www.facebook.com`

Destination domains that will be blocked for the users that are allowed to use the proxy.  
Put each entry on a separate line. You can also use regular expressions.

Block User Agents

Enter user agents that will be blocked for the users that are allowed to use the proxy.  
Put each entry on a separate line. You can also use regular expressions.

Block MIME Types (Reply Only)

Enter MIME types that will be blocked for the users that are allowed to use the proxy. Useful to block javascript  
(application/javascript).

pr56333@student.vit.edu.au [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Recycle Bin

Command Prompt

Microsoft Windows [Version 10.0.10045.2006]  
(c) Microsoft Corporation. All rights reserved.

C:\Users\pr56333>ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

```
Connection-specific DNS Suffix . : home.arpa
Link-local IPv6 Address . . . . . : fe80::cc21:30f7:bdb2:82d9%7
IPv4 Address . . . . . : 192.168.100.101
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : fe80::a00:27ff:fe80:8cc6%7
```

C:\Users\pr56333>ping 192.168.100.1

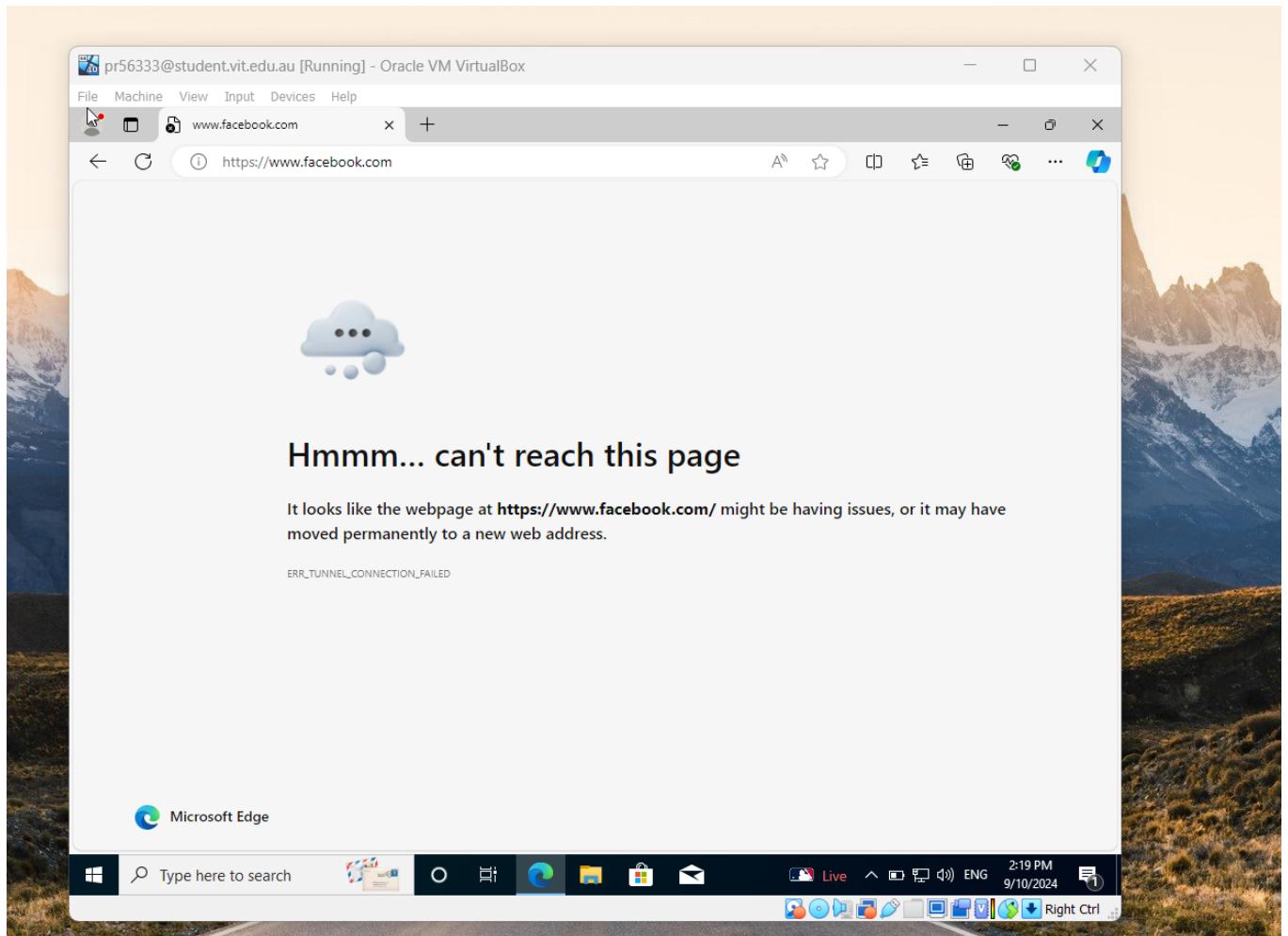
```
Pinging 192.168.100.1 with 32 bytes of data:
Reply from 192.168.100.1: bytes=32 time<1ms TTL=64
Reply from 192.168.100.1: bytes=32 time=13ms TTL=64
Reply from 192.168.100.1: bytes=32 time<1ms TTL=64
Reply from 192.168.100.1: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.100.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 13ms, Average = 3ms
```

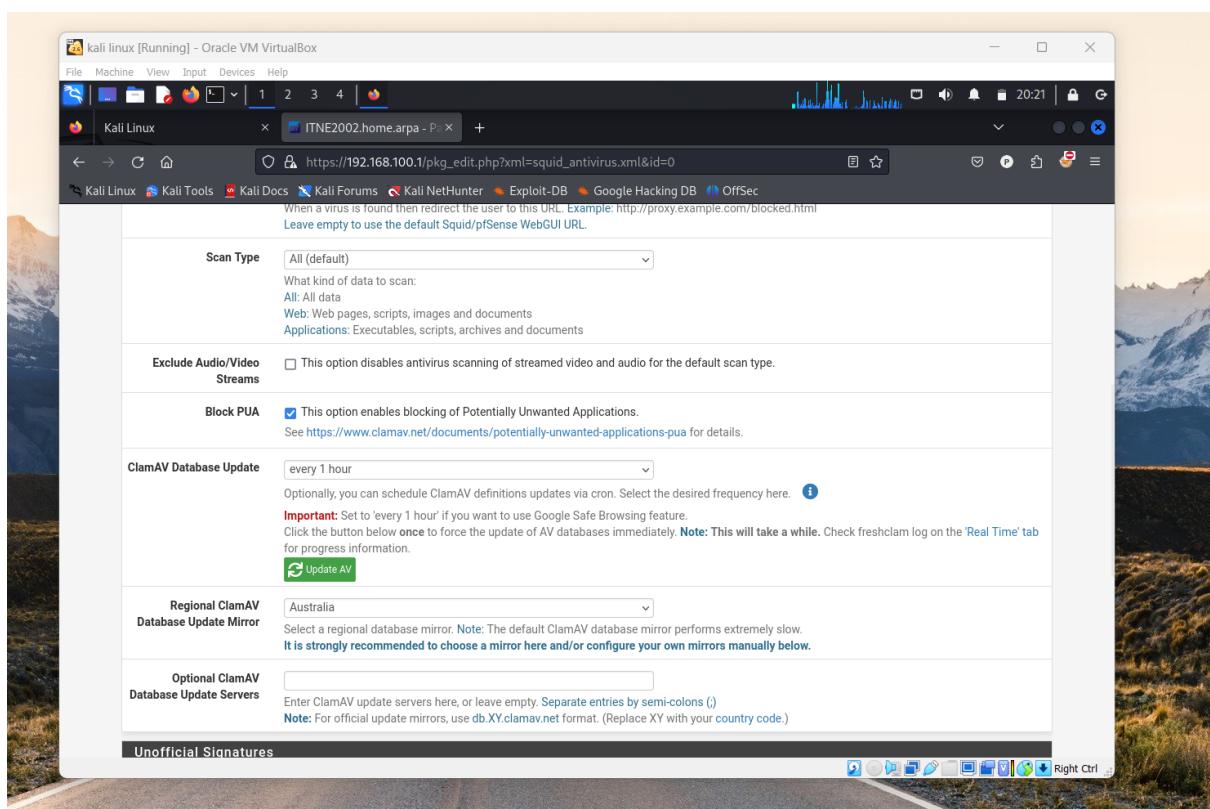
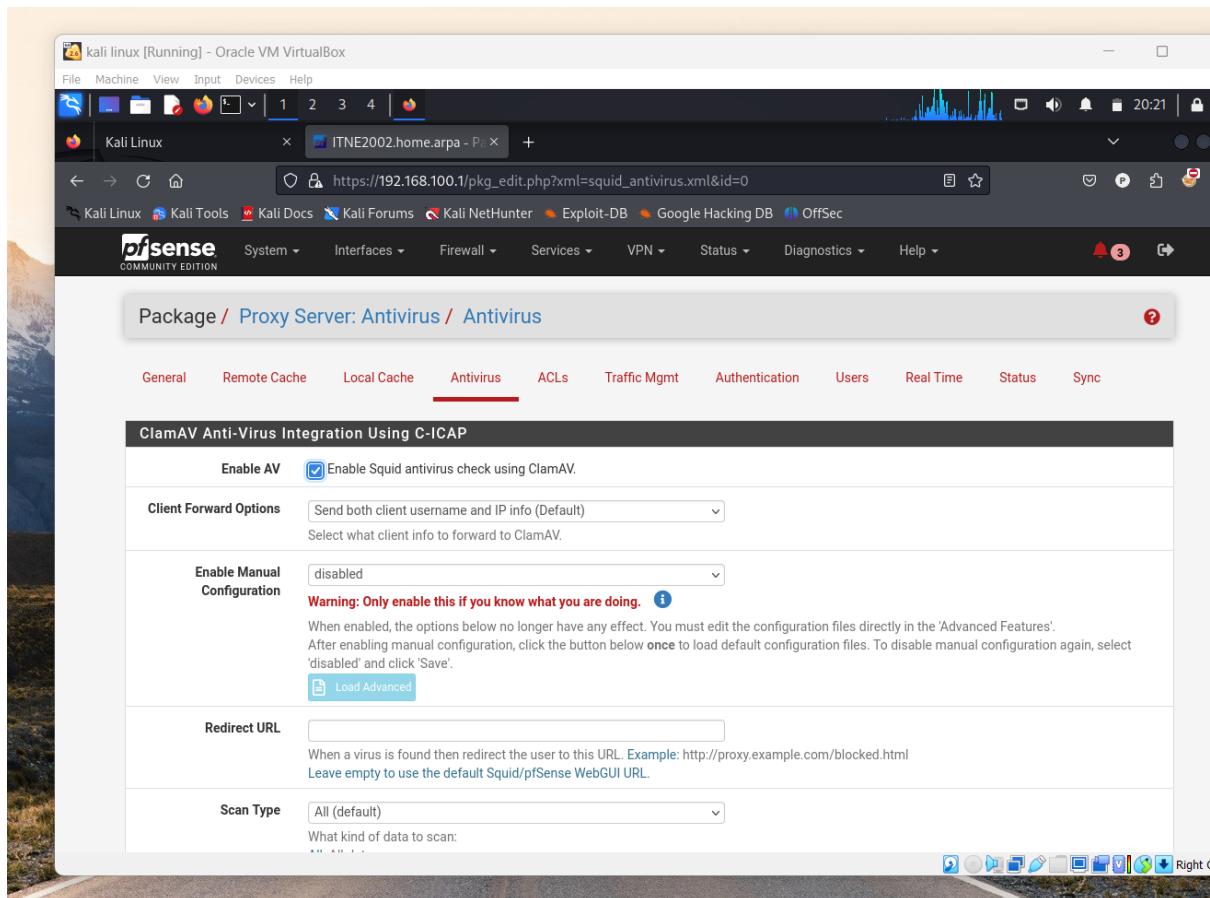
C:\Users\pr56333>

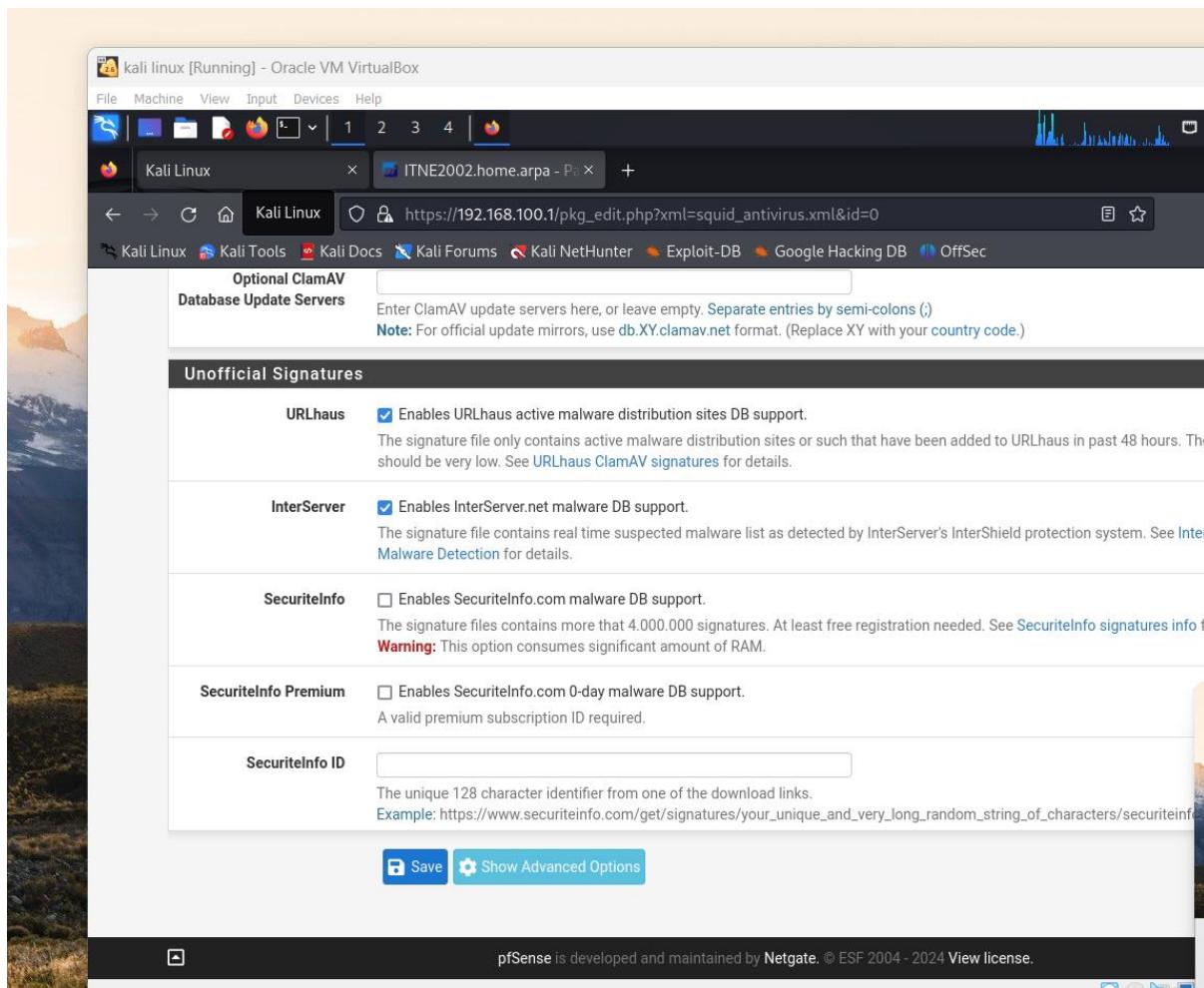
Windows 10 Enterprise Evaluation  
Windows License valid for 79 days  
Build 19041.vb\_release.191206-1406

16°C 2:18 PM ENG 9/10/2024

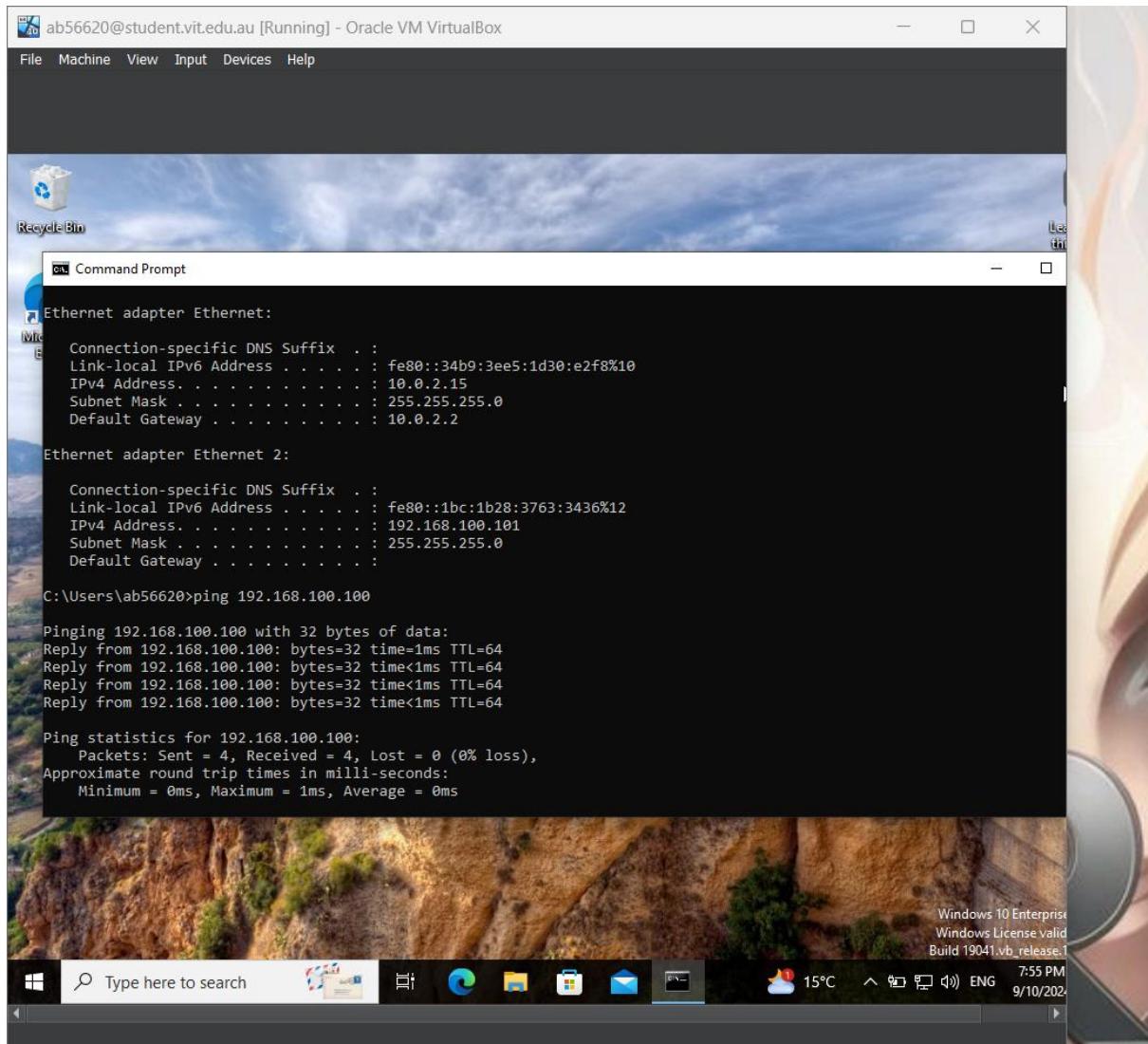


## c. Installing ClamAV





**d. Scan windows 10 using Kali using Nmap and then provide a complete report on open ports and fix those.**



ab56620@student.vit.edu.au [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Recycle Bin

Command Prompt

```
Ethernet adapter Ethernet:
Connection-specific DNS Suffix . :
Link-local IPv6 Address . . . . . : fe80::34b9:3ee5:1d30:e2f8%10
IPv4 Address. . . . . : 10.0.2.15
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 10.0.2.2

Ethernet adapter Ethernet 2:
Connection-specific DNS Suffix . :
Link-local IPv6 Address . . . . . : fe80::1bc:1b28:3763:3436%12
IPv4 Address. . . . . : 192.168.100.101
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . :

C:\Users\ab56620>ping 192.168.100.100

Pinging 192.168.100.100 with 32 bytes of data:
Reply from 192.168.100.100: bytes=32 time=1ms TTL=64
Reply from 192.168.100.100: bytes=32 time<1ms TTL=64
Reply from 192.168.100.100: bytes=32 time<1ms TTL=64
Reply from 192.168.100.100: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.100.100:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Windows 10 Enterprise  
Windows License valid  
Build 19041.vb\_release.1

Type here to search    15°C    7:55 PM  
ENG 9/10/2022

```
kali-linux [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
ping 192.168.100.101 (192.168.100.101) 56(84) bytes of data.
64 bytes from 192.168.100.101: icmp_seq=1 ttl=128 time=171 ms
64 bytes from 192.168.100.101: icmp_seq=2 ttl=128 time=109 ms
64 bytes from 192.168.100.101: icmp_seq=3 ttl=128 time=60.3 ms
64 bytes from 192.168.100.101: icmp_seq=4 ttl=128 time=213 ms
64 bytes from 192.168.100.101: icmp_seq=5 ttl=128 time=389 ms
64 bytes from 192.168.100.101: icmp_seq=6 ttl=128 time=128 ms
64 bytes from 192.168.100.101: icmp_seq=7 ttl=128 time=138 ms
| ssh-hostkey:
|_ 3072 56:06:c4:1f:15:9e:70:f4:07:6c:e9:a4:da:91:ba:5f (RSA)
|_ 256 7a:2b:7f:23:70:f3:87:c8:e9:a1:0c:10:19:24:b2:23 (ECDSA)
|_ 256 eb:90:28:fe:69:c2:ac:48:d1:a0:8c:d3:f7:2b:61:7c (ED25519)
80/tcp open http Microsoft IIS httpd 10.0
|_http-server-header: Microsoft-IIS/10.0
|_http-title: IIS Windows
| http-methods:
|_ Potentially risky methods: TRACE
135/tcp open msrpc Microsoft Windows RPC
139/tcp open netbios-ssn Microsoft Windows netbios-ssn
445/tcp open microsoft-ds?
3306/tcp open mysql MariaDB (unauthorized)
MAC Address: 08:00:27:36:B3:84 (Oracle VirtualBox virtual NIC)
```

```
kali-linux [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
ab56620@kali: ~
File Actions Edit View Help
$ sudo nmap -sS -sV -O -A 192.168.100.101
Starting Nmap 7.94SVN ( https://nmap.org ) at 2024-10-09 19:53 AEDT
Nmap scan report for 192.168.100.101
Host is up (0.00081s latency).
Not shown: 993 closed tcp ports (reset)
PORT      STATE SERVICE      VERSION
21/tcp    open  ftp          Microsoft ftptd
|_ftp-syst:
|_ SYST: Windows_NT
22/tcp    open  ssh          OpenSSH for_Windows_8.1 (protocol 2.0)
| ssh-hostkey:
|_ 3072 56:06:c4:1f:15:9e:70:f4:07:6c:e9:a4:da:91:ba:5f (RSA)
|_ 256 7a:2b:7f:23:70:f3:87:c8:e9:a1:0c:10:19:24:b2:23 (ECDSA)
|_ 256 eb:90:28:fe:69:c2:ac:48:d1:a0:8c:d3:f7:2b:61:7c (ED25519)
80/tcp    open  http         Microsoft IIS httpd 10.0
|_http-server-header: Microsoft-IIS/10.0
|_http-title: IIS Windows
| http-methods:
|_ Potentially risky methods: TRACE
135/tcp   open  msrpc        Microsoft Windows RPC
139/tcp   open  netbios-ssn  Microsoft Windows netbios-ssn
445/tcp   open  microsoft-ds?
3306/tcp  open  mysql        MariaDB (unauthorized)
MAC Address: 08:00:27:36:B3:84 (Oracle VirtualBox virtual NIC)
Device type: general purpose
Running: Microsoft Windows 10
OS CPE: cpe:/o:microsoft:windows_10
OS details: Microsoft Windows 10 1709 - 1909
Network Distance: 1 hop
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: 2024-10-09T08:53:32
|_ start_date: N/A
|_nbstat: NetBIOS name: DESKTOP-B4R9ONF, NetBIOS user: <unknown>, NetBIOS MAC: 08:00:27:36:b3:84 (Oracle VirtualBox virtual NIC)

TRACEROUTE
HOP RTT      ADDRESS
1  0.81 ms  192.168.100.101

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 14.11 seconds
```

## e. Configure firewall in pfSense

The screenshot shows a web browser window on a Kali Linux VM in Oracle VM VirtualBox. The URL in the address bar is [https://192.168.100.1/pkg\\_edit.php?xml=squid\\_nac.xml&id=0](https://192.168.100.1/pkg_edit.php?xml=squid_nac.xml&id=0). The page title is "Package / Proxy Server: Ac". The top navigation bar includes links for File, Machine, View, Input, Devices, Help, and several system status indicators. The main menu has tabs for System, Interfaces, Firewall (which is currently selected), Services, VPN, Status, Diagnostics, and Help. A sub-menu for Firewall is open, showing options: Aliases, NAT, Rules, Schedules, Traffic Shaper, and Virtual IPs. The main content area is titled "Squid Access Control Lists" and contains three sections: "Allowed Subnets", "Unrestricted IPs", and "Banned Hosts Addresses". Each section has a text input field for entering network configurations. Below the "Allowed Subnets" section, there is a note: "Enter subnets that are allowed to use the proxy in CIDR format. All the other subnets won't be able to use the proxy. Put each entry on a separate line. When 'Allow Users on Interface' is checked on 'General' tab, there is no need to add the 'Proxy Interface(s)' subnet(s) to this list." Below the "Unrestricted IPs" section, there is a note: "Enter unrestricted IP address(es) / network(s) in CIDR format. Configured entries will NOT be filtered out by the other access control directives set in this page. Put each entry on a separate line." Below the "Banned Hosts Addresses" section, there is a note: "Enter IP address(es) / network(s) in CIDR format. Configured entries will NOT be allowed to use the proxy." At the bottom of the page, the URL [https://192.168.100.1/firewall\\_rules.php](https://192.168.100.1/firewall_rules.php) is shown again, followed by the same notes about CIDR format and filtering.

kali linux [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Kali Linux ITNE2002.home.arpa - Fi +

https://192.168.100.1/firewall\_rules.php?if=lan

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pfSense COMMUNITY EDITION System Interfaces Firewall Services VPN Status Diagnostics Help

Firewall / Rules / LAN

Floating WAN LAN

Rules (Drag to Change Order)

States	Protocol	Source	Port	Destination	Port	Gateway	Queue	Schedule	Description	Actions
✓ 2/1.81 MiB	*	*	*	LAN Address	443 80	*	*	*	Anti-Lockout Rule	
✗ 27/474.49 MiB	IPv4 TCP	LAN subnets	*	LAN address	3184	*	none			
✗ 0/11 KiB	IPv4 *	LAN subnets	*	*	*	*	none		Default allow LAN to any rule	
✗ 0/0 B	IPv6 *	LAN subnets	*	*	*	*	none		Default allow LAN IPv6 to any rule	

Add Add Delete Toggle Copy Save Separator

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