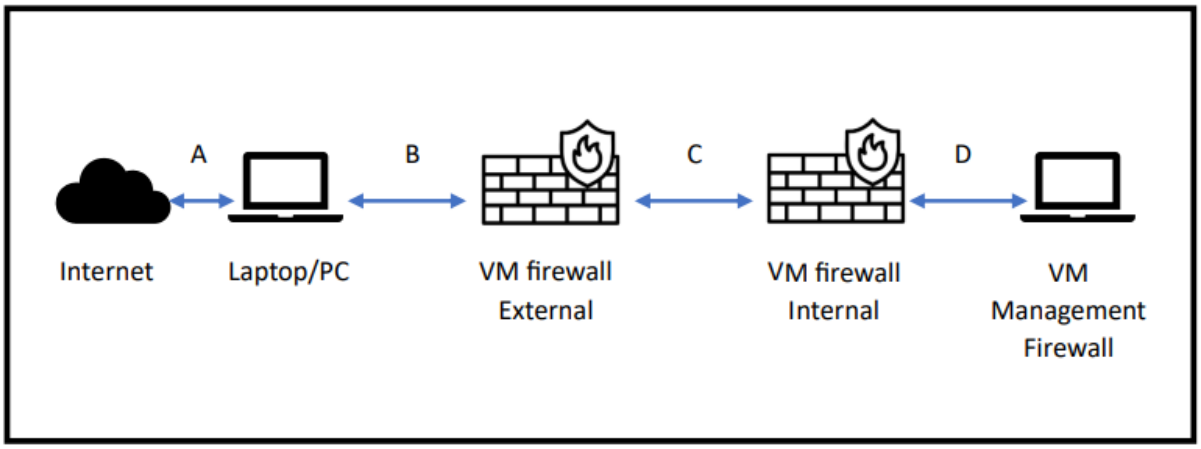
IMPLEMENTASI INTERNAL DAN EXTERNAL FIREWALL

I. PENDAHULUAN

Firewall adalah sistem keamanan jaringan yang berfungsi sebagai pengontrol akses antara jaringan internal (yang dianggap aman) dan jaringan eksternal (seperti internet, yang dianggap tidak aman). Firewall bekerja sebagai penghalang yang memeriksa dan memfilter lalu lintas jaringan berdasarkan aturan keamanan yang telah ditetapkan, mencegah akses yang tidak sah dan ancaman dari luar. Firewall melindungi jaringan dengan memonitor dan mengendalikan data yang masuk dan keluar berdasarkan kriteria tertentu seperti alamat IP, port, dan protokol. Cara kerjanya dapat bervariasi tergantung pada jenis firewall yang digunakan

II. ALAT DAN BAHAN

- Laptop dengan minimal RAM 8 GB dan Free Storage 100 GB
- Hypervisor: Virtualbox / VMWare Workstation / Hyper-V / Qemu/KVM
- PfSense
- OPNSense
- Alma Llinux / Rocky Linux / RHEL
- Topologi :



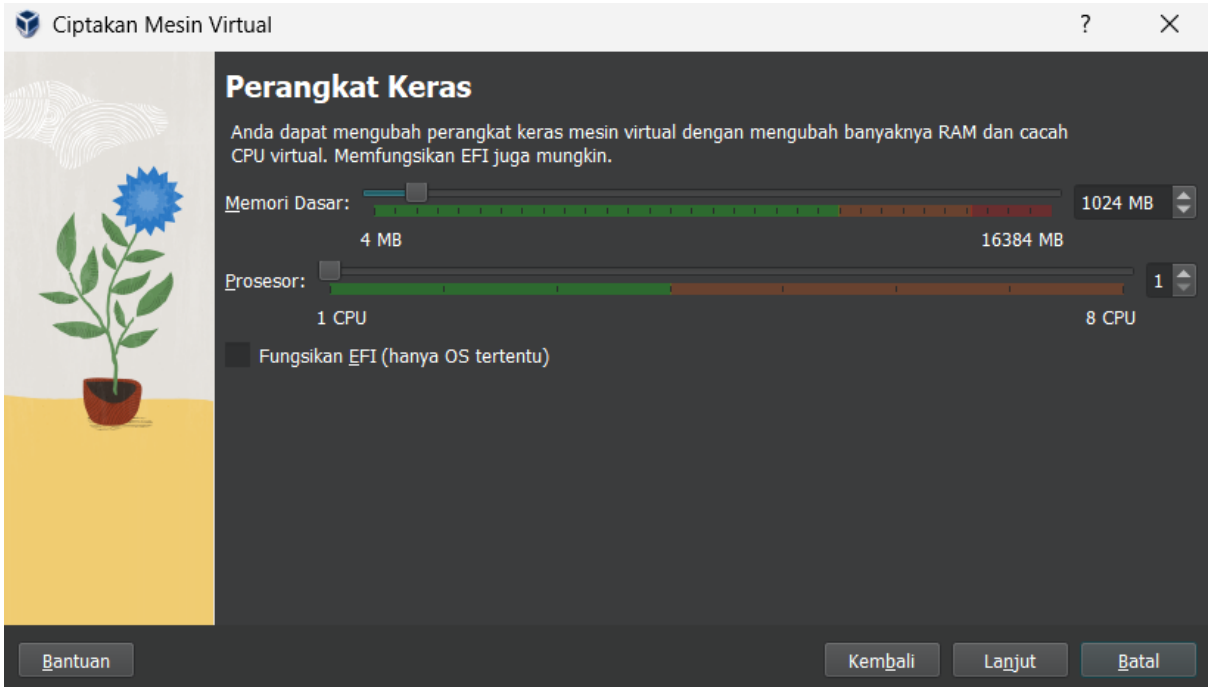
1. Merupakan koneksi antara internet dan laptop/PC, dapat berupa wired ataupun wireless
2. Merupakan koneksi antara Laptop dengan lingkungan virtual dengan koneksi tipe NAT
3. Merupakan koneksi antara VM Firewall External dan VM Firewall Internal dengan koneksi tipe "Internal Network (Virtualbox)" atau "LAN Segment (VMware)" dan subnet jaringan 10.10.10.0/24

4. Merupakan koneksi antara VM Firewall Internal dan VM Management Firewall dengan koneksi tipe "Internal Network (Virtualbox)" atau "LAN Segment (VMware)" dan subnet jaringan 10.10.20.0/24

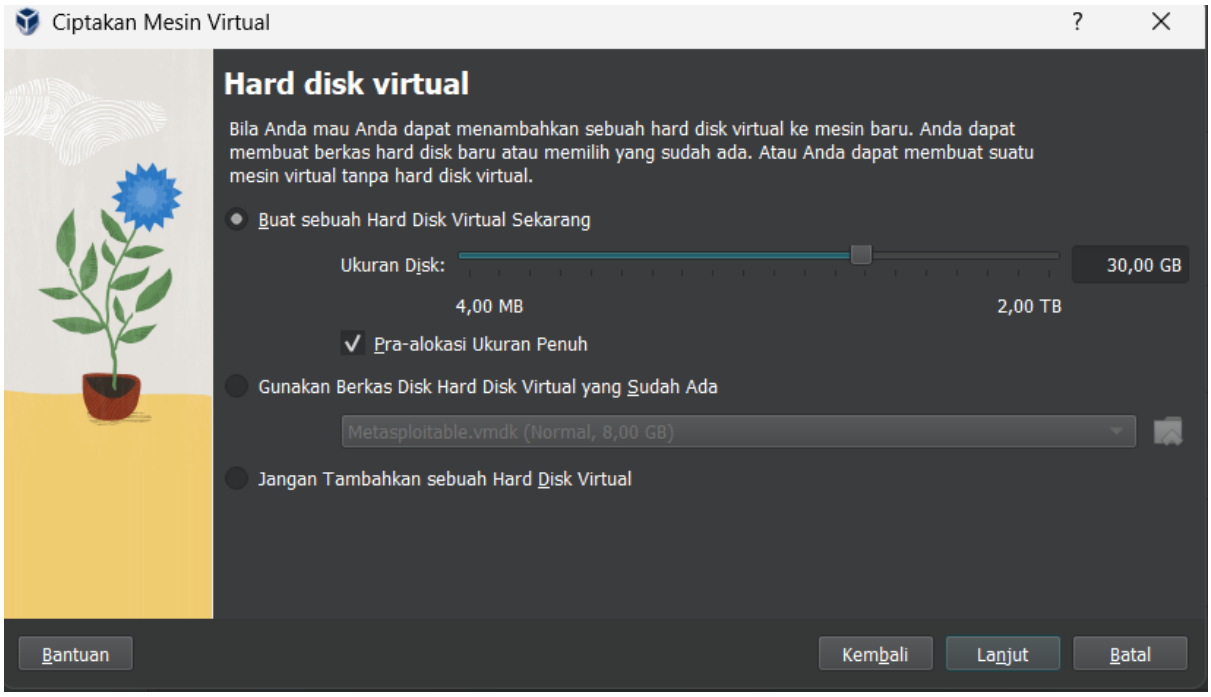
III. Install pfsense – VM firewall external

1. Install pfsense pada virtual mesin

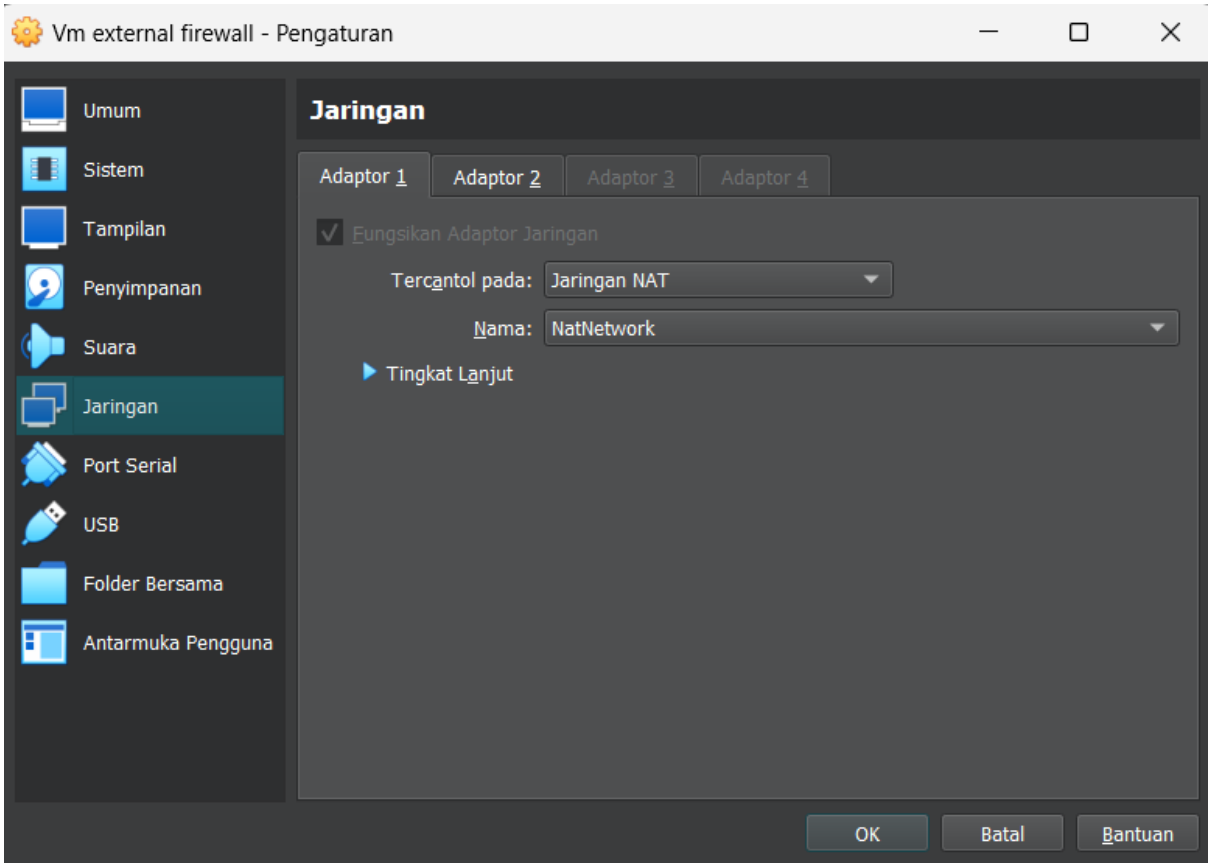
2. Setting ram dan cpu vm firewall external

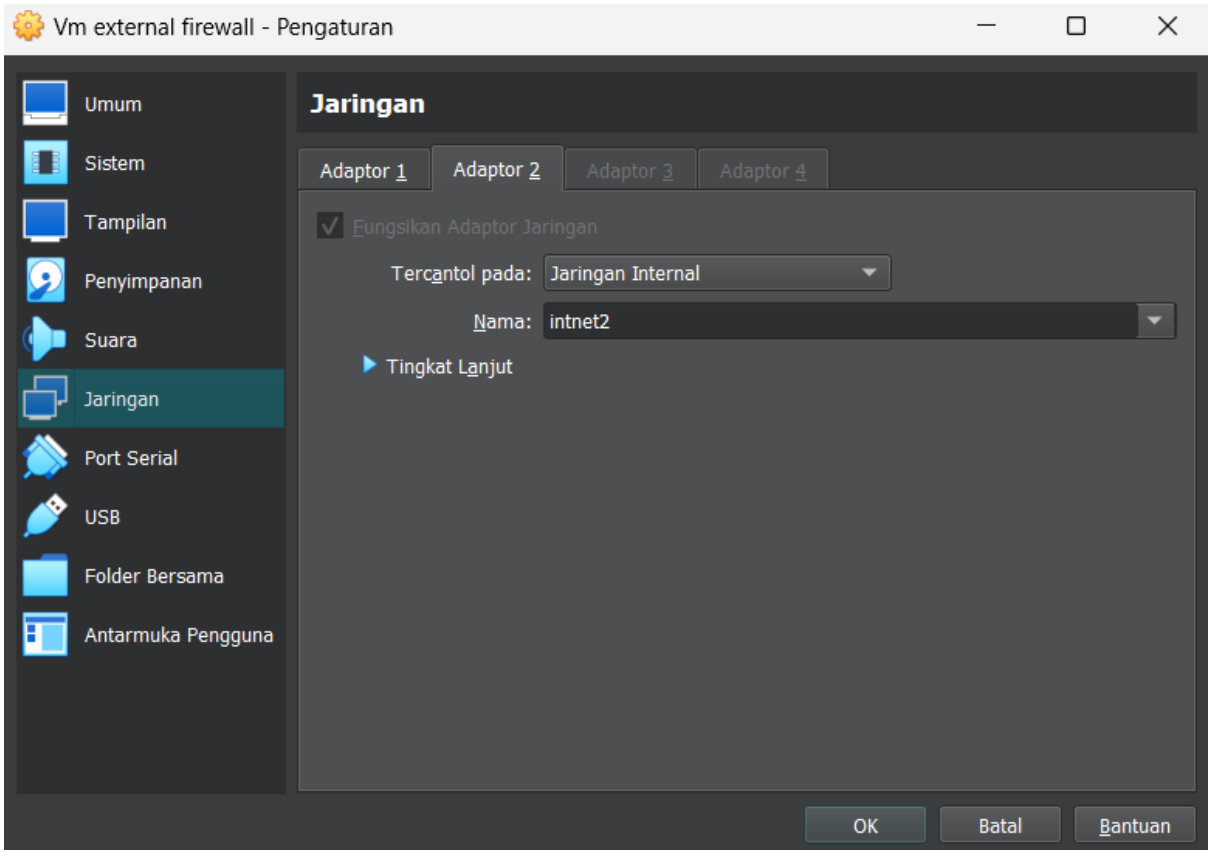


3. Setting penyimpanan sebesar 30gb

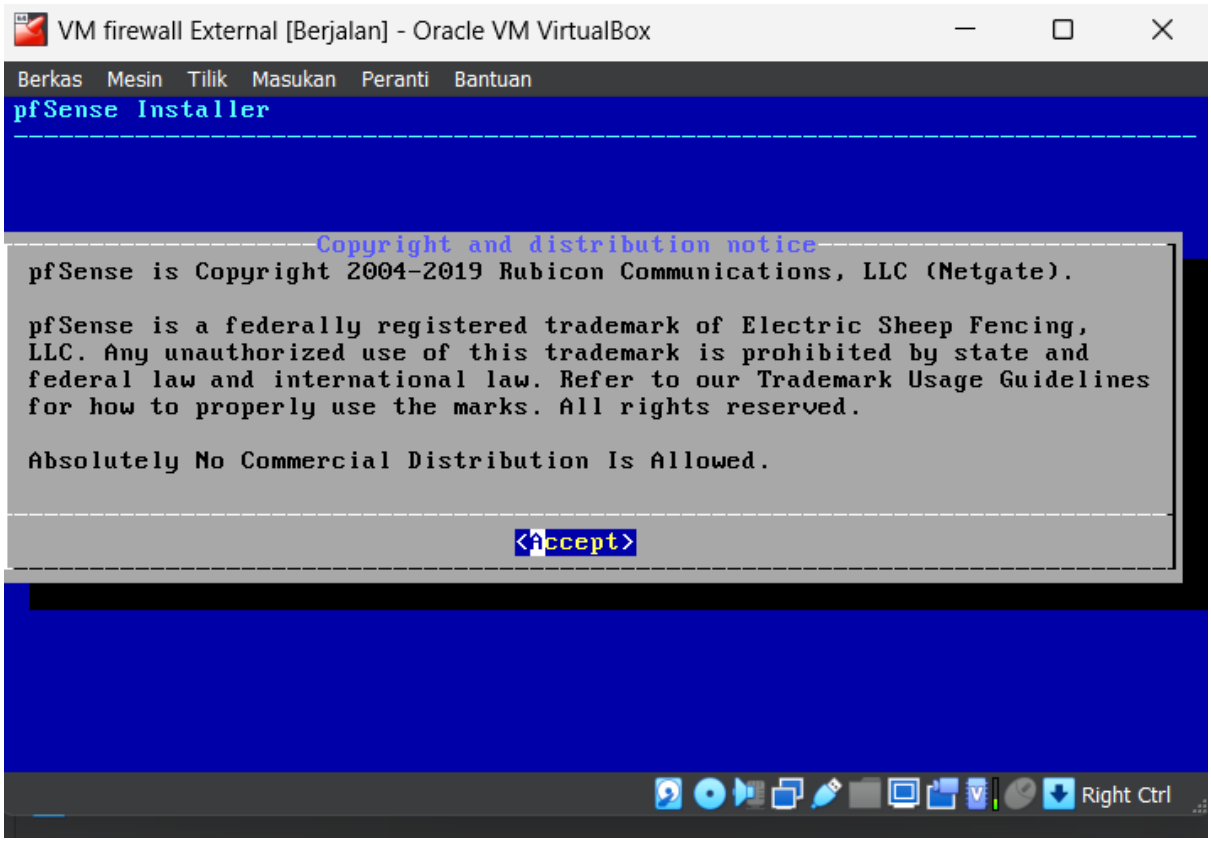


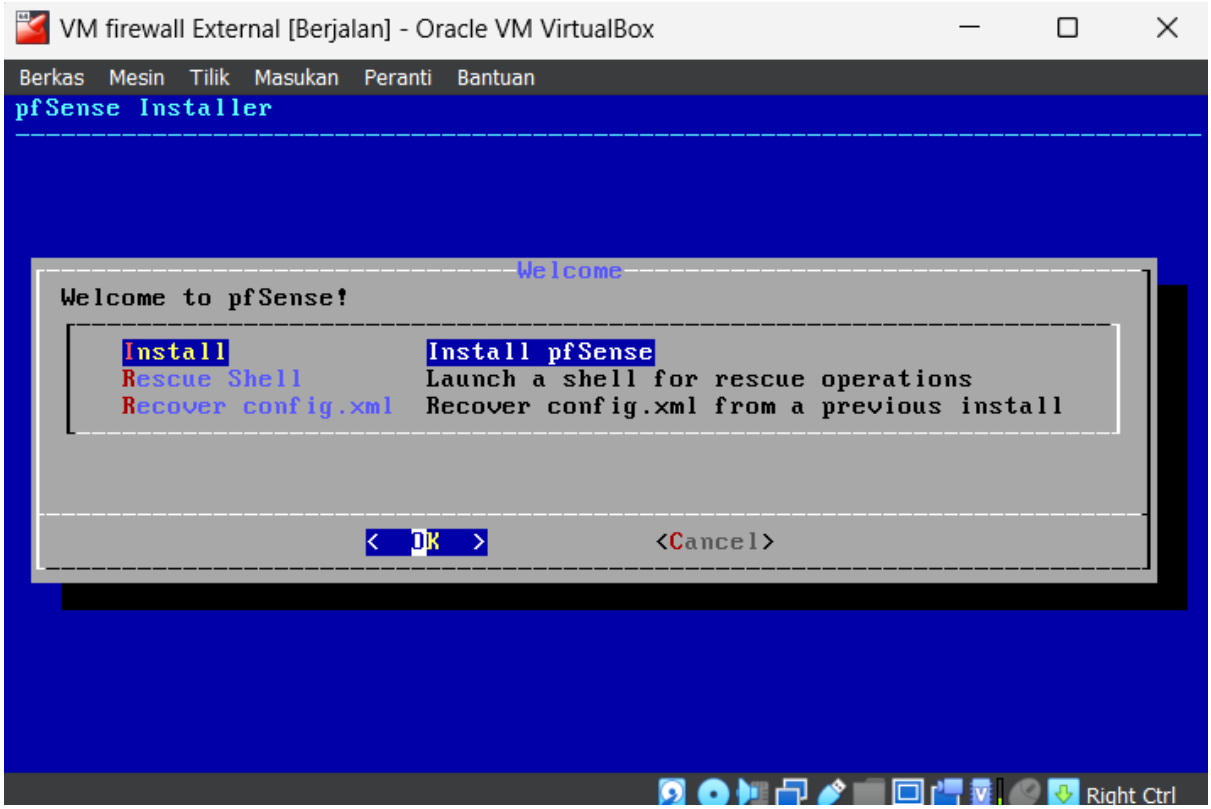
4. Setting jaringan firewall external menggunakan jaringan NAT dan jaringan internal intnet2

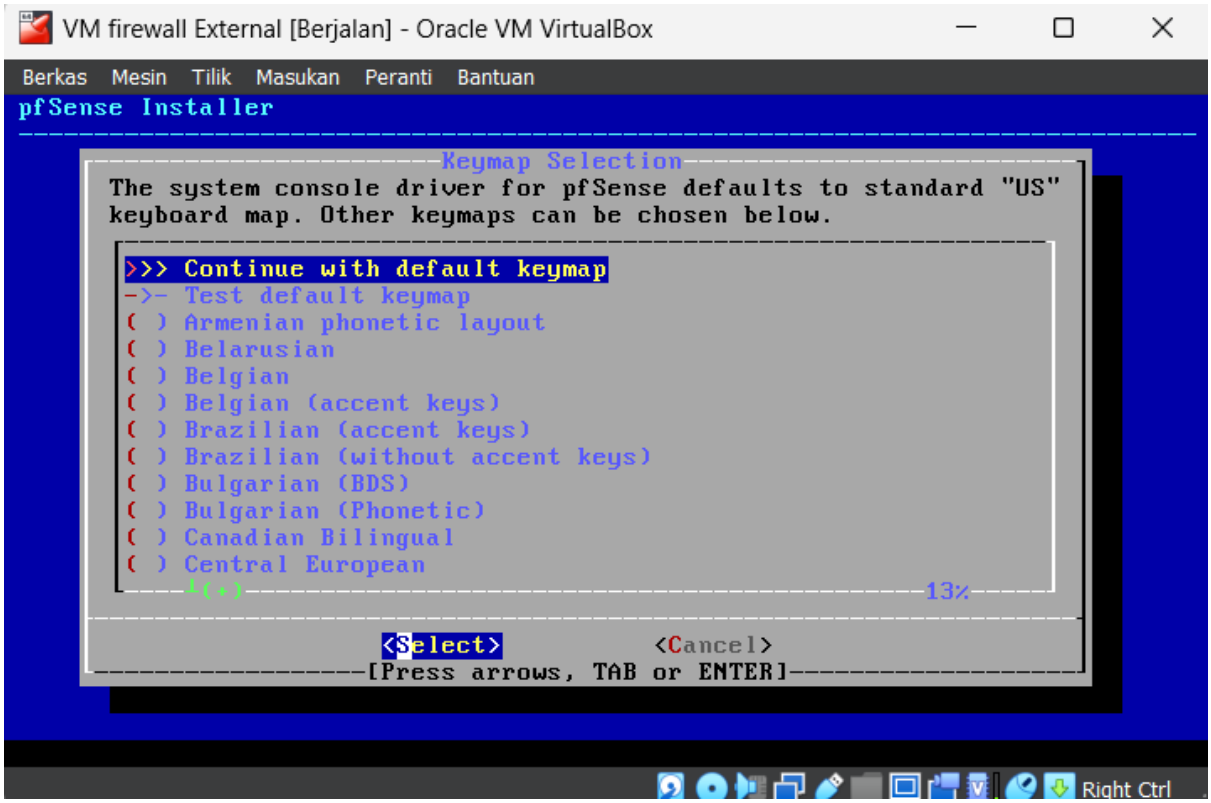


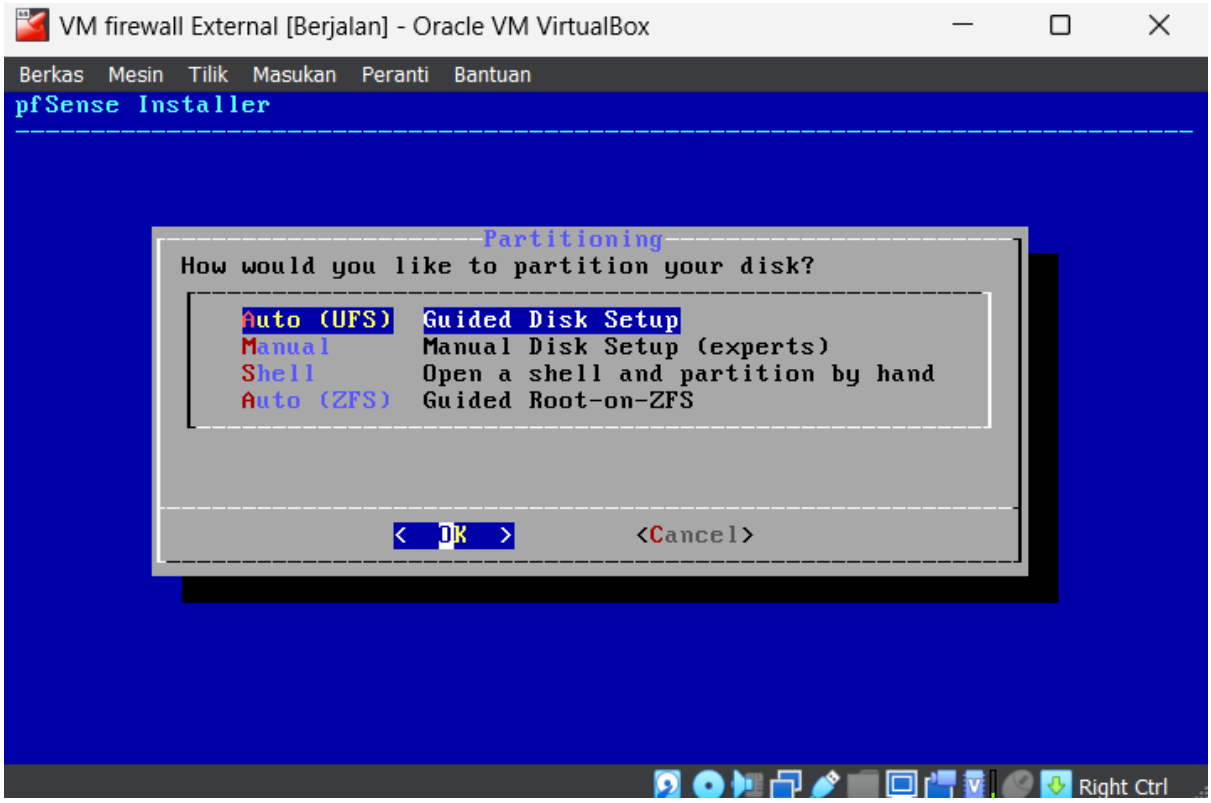


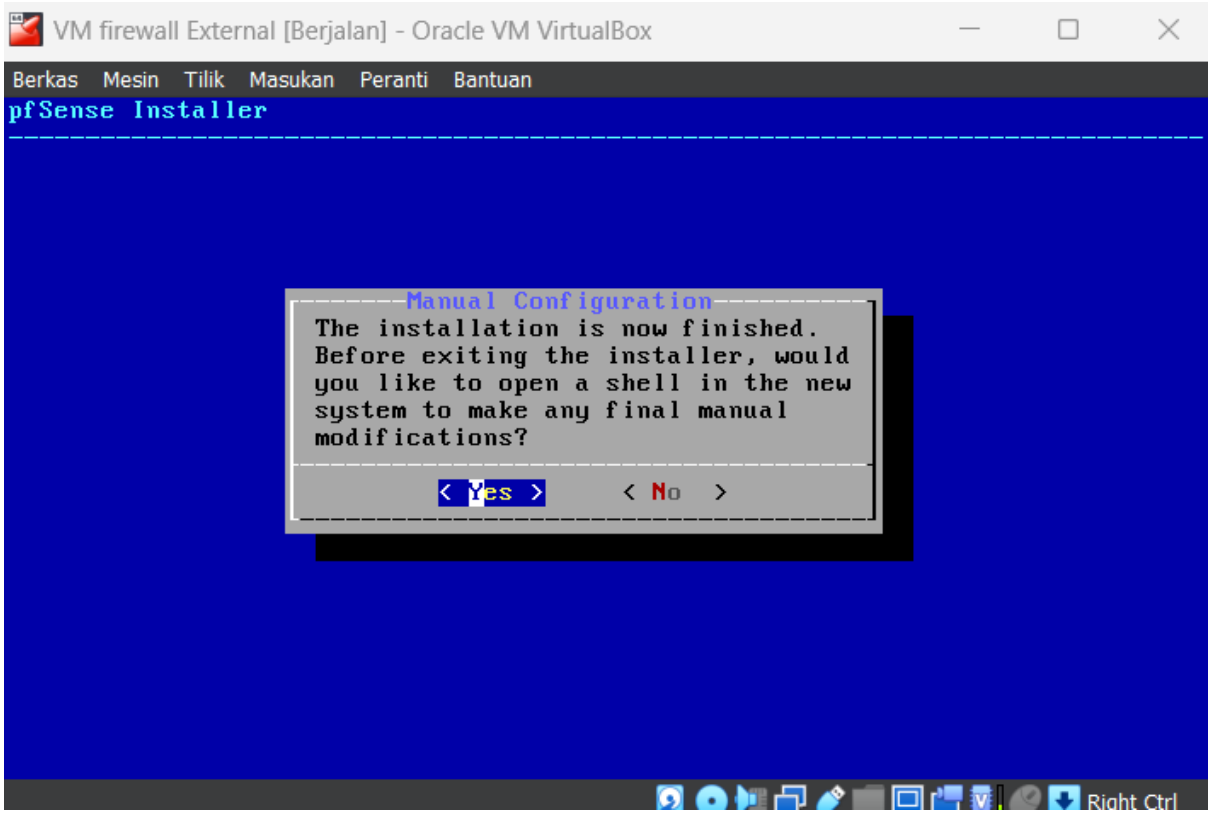
5. Instalasi pfsense

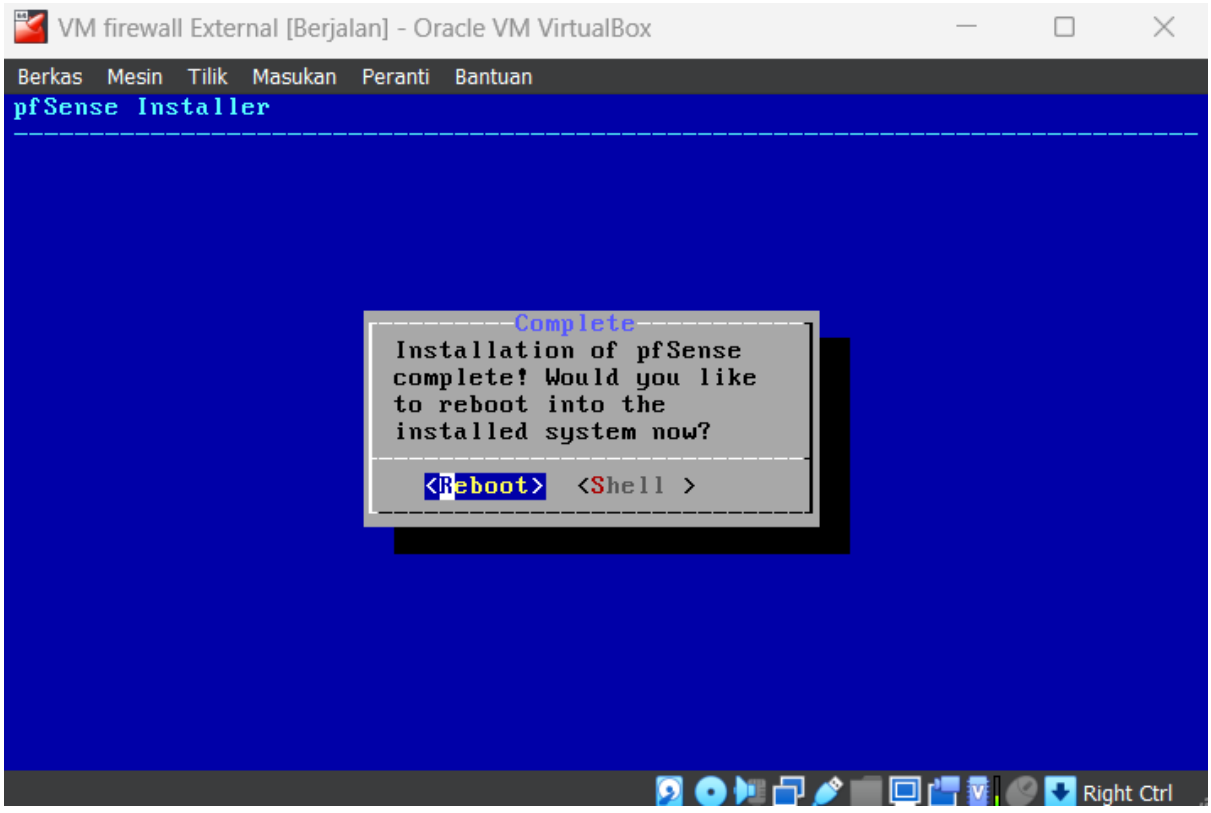

VM firewall External [Berjalan] - Oracle VM VirtualBox
Berkas Mesin Tilik Masukan Peranti Bantuan
pfSense Installer
Copyright and distribution notice
pfSense is Copyright 2004-2019 Rubicon Communications, LLC (Netgate).
pfSense is a federally registered trademark of Electric Sheep Fencing, LLC. Any unauthorized use of this trademark is prohibited by state and federal law and international law. Refer to our Trademark Usage Guidelines for how to properly use the marks. All rights reserved.
Absolutely No Commercial Distribution Is Allowed.
<Accept>
Right Ctrl

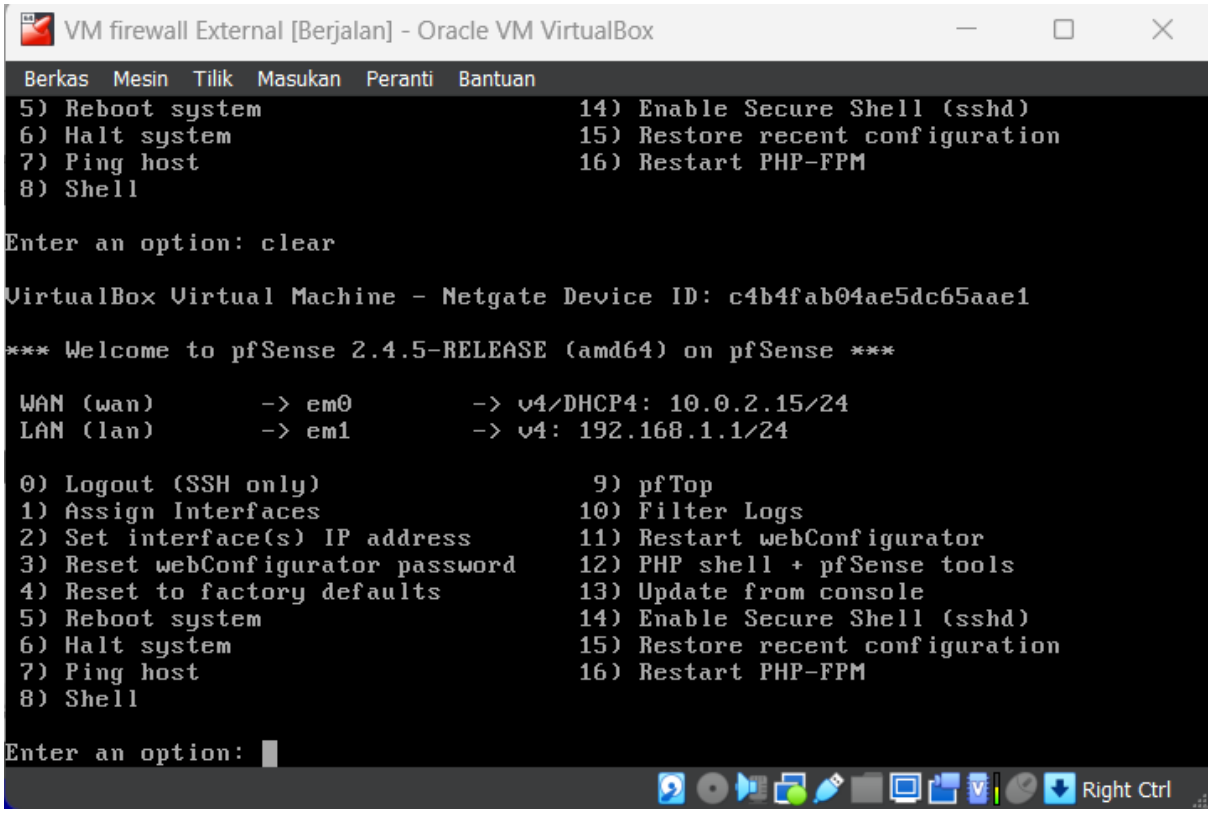

VM firewall External [Berjalan] - Oracle VM VirtualBox
Berkas Mesin Tilik Masukan Peranti Bantuan
pfSense Installer
Welcome
Welcome to pfSense!
Install Install pfSense
Rescue Shell Launch a shell for rescue operations
Recover config.xml Recover config.xml from a previous install
< OK >
<Cancel>
Right Ctrl


VM firewall External [Berjalan] - Oracle VM VirtualBox
Berkas Mesin Tilik Masukan Peranti Bantuan
pfSense Installer
Keymap Selection
The system console driver for pfSense defaults to standard "US"
keyboard map. Other keymaps can be chosen below.
>>> Continue with default keymap
->- Test default keymap
( ) Armenian phonetic layout
( ) Belarusian
( ) Belgian
( ) Belgian (accent keys)
( ) Brazilian (accent keys)
( ) Brazilian (without accent keys)
( ) Bulgarian (BDS)
( ) Bulgarian (Phonetic)
( ) Canadian Bilingual
( ) Central European
13%
<Select>
<Cancel>
[Press arrows, TAB or ENTER]
Right Ctrl


VM firewall External [Berjalan] - Oracle VM VirtualBox
Berkas Mesin Tilik Masukan Peranti Bantuan
pfSense Installer
Partitioning
How would you like to partition your disk?
Auto (UFS) Guided Disk Setup
Manual Manual Disk Setup (experts)
Shell Open a shell and partition by hand
Auto (ZFS) Guided Root-on-ZFS
< OK >
<Cancel>
Right Ctrl


VM firewall External [Berjalan] - Oracle VM VirtualBox
Berkas Mesin Tilik Masukan Peranti Bantuan
pfSense Installer
Manual Configuration
The installation is now finished.
Before exiting the installer, would
you like to open a shell in the new
system to make any final manual
modifications?
< Yes >
< No >
Right Ctrl

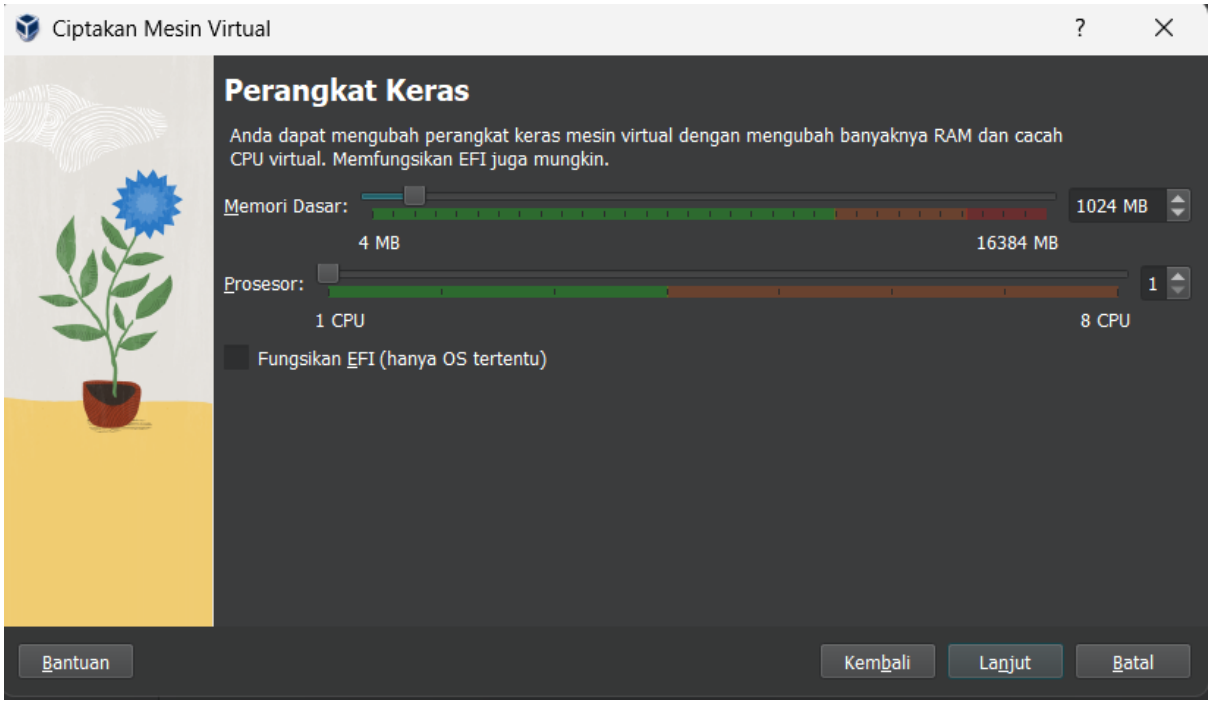

VM firewall External [Berjalan] - Oracle VM VirtualBox
Berkas Mesin Tilik Masukan Peranti Bantuan
pfSense Installer
Complete
Installation of pfSense
complete! Would you like
to reboot into the
installed system now?
<Reboot> <Shell >
Right Ctrl



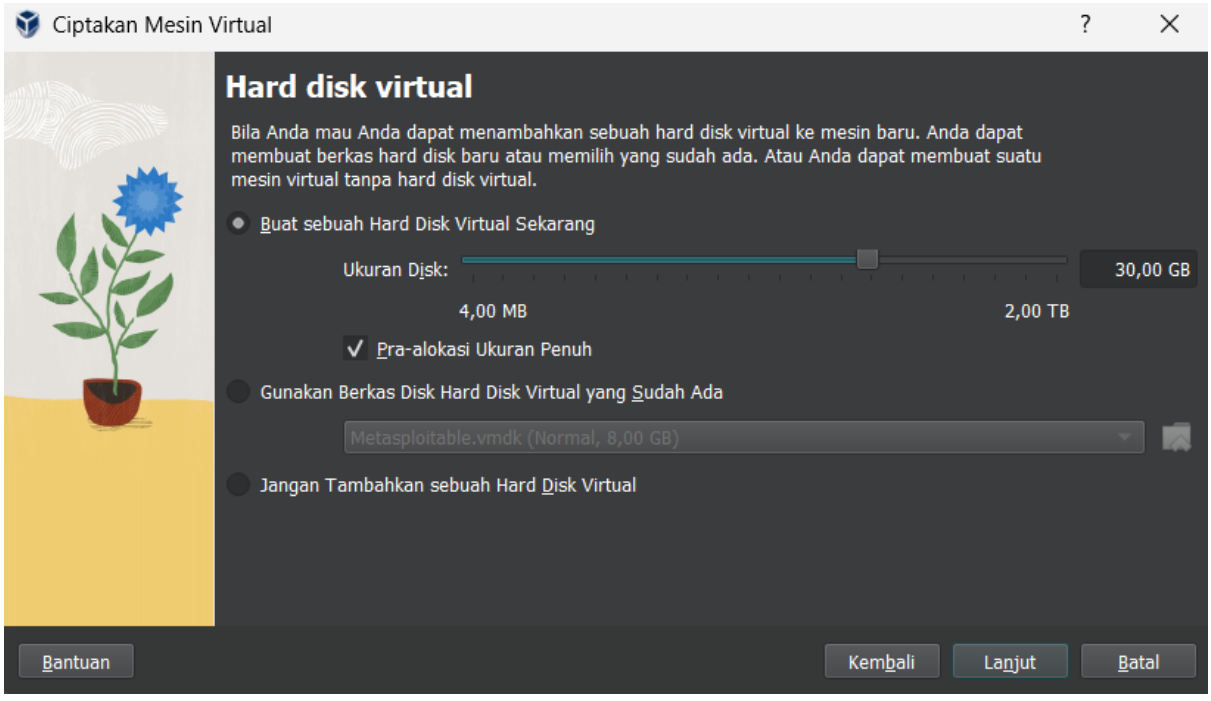
IV. Install OPNSense – VM firewall internal

1. Install opnsense pada virtualbox

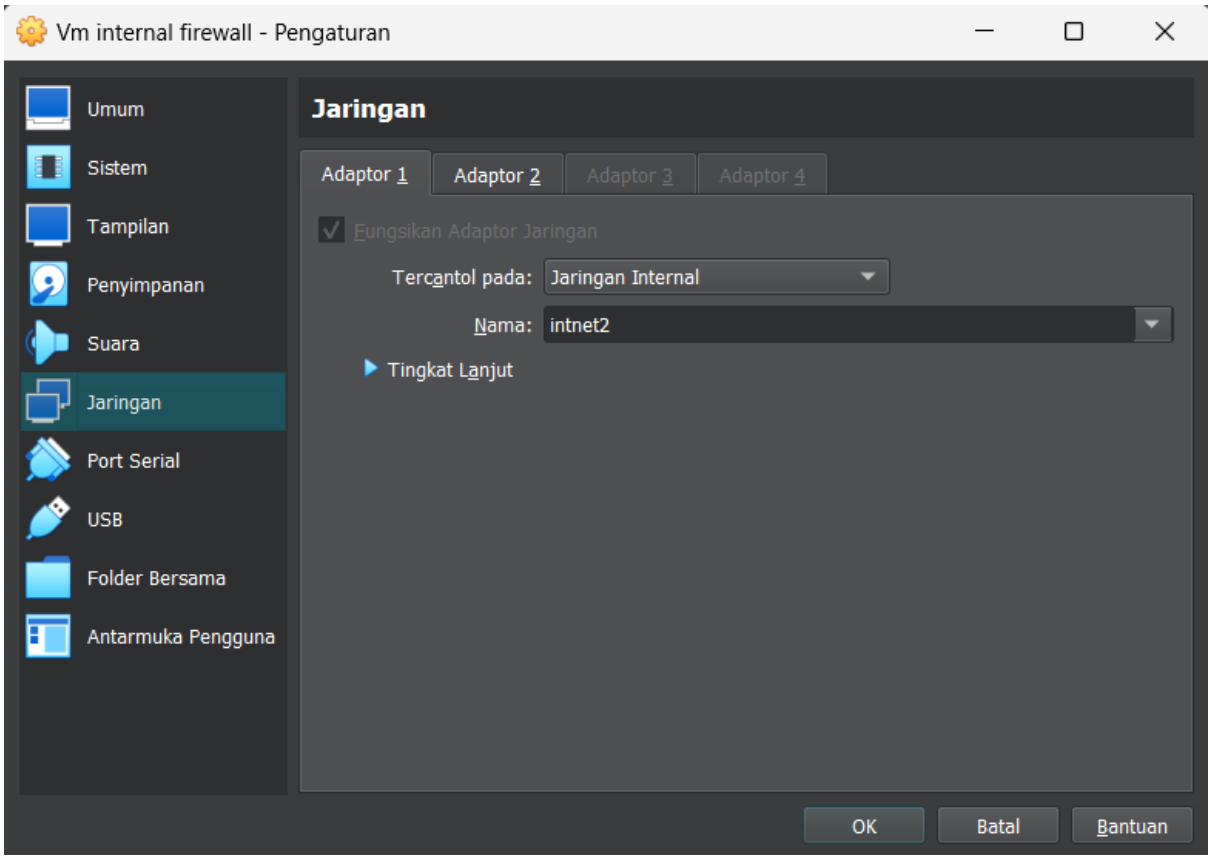
2. Setting ram dan cpu vm firewall external

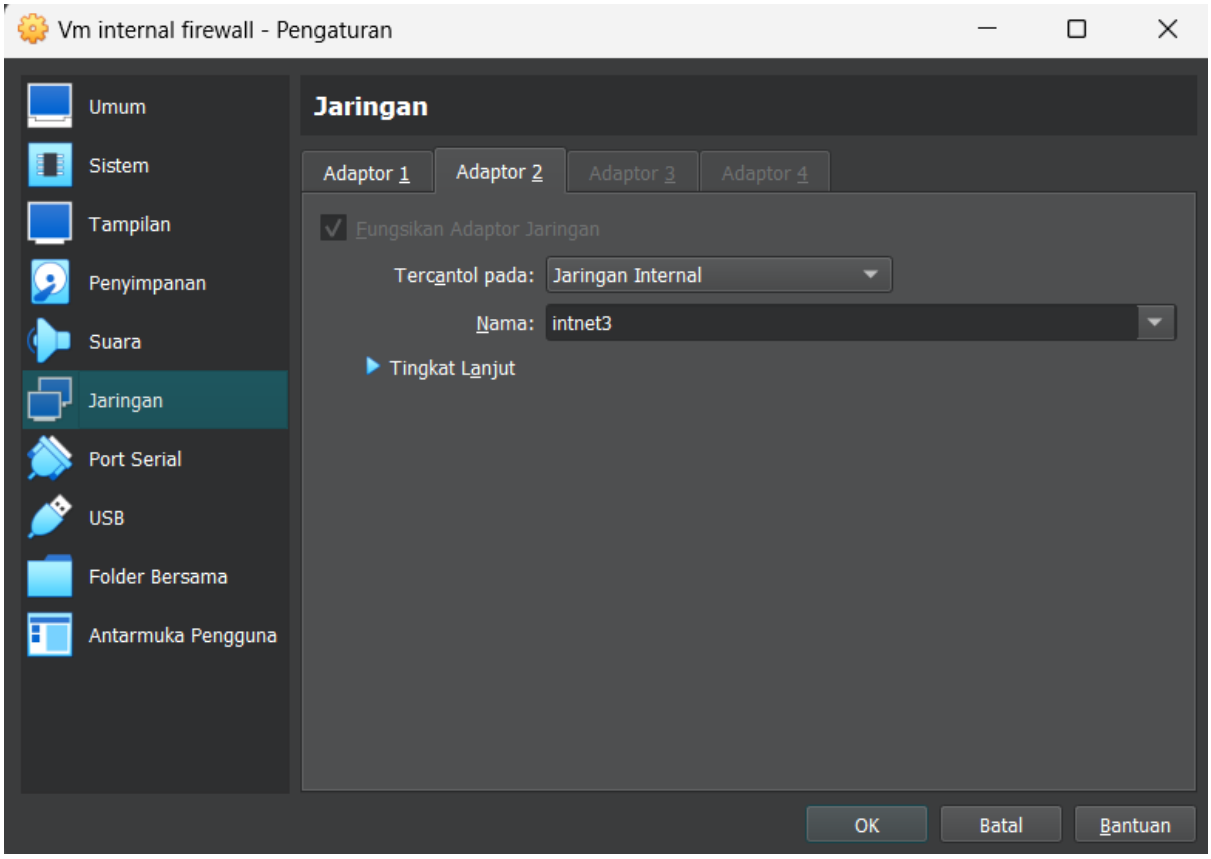


3. Setting penyimpanan sebesar 30gb

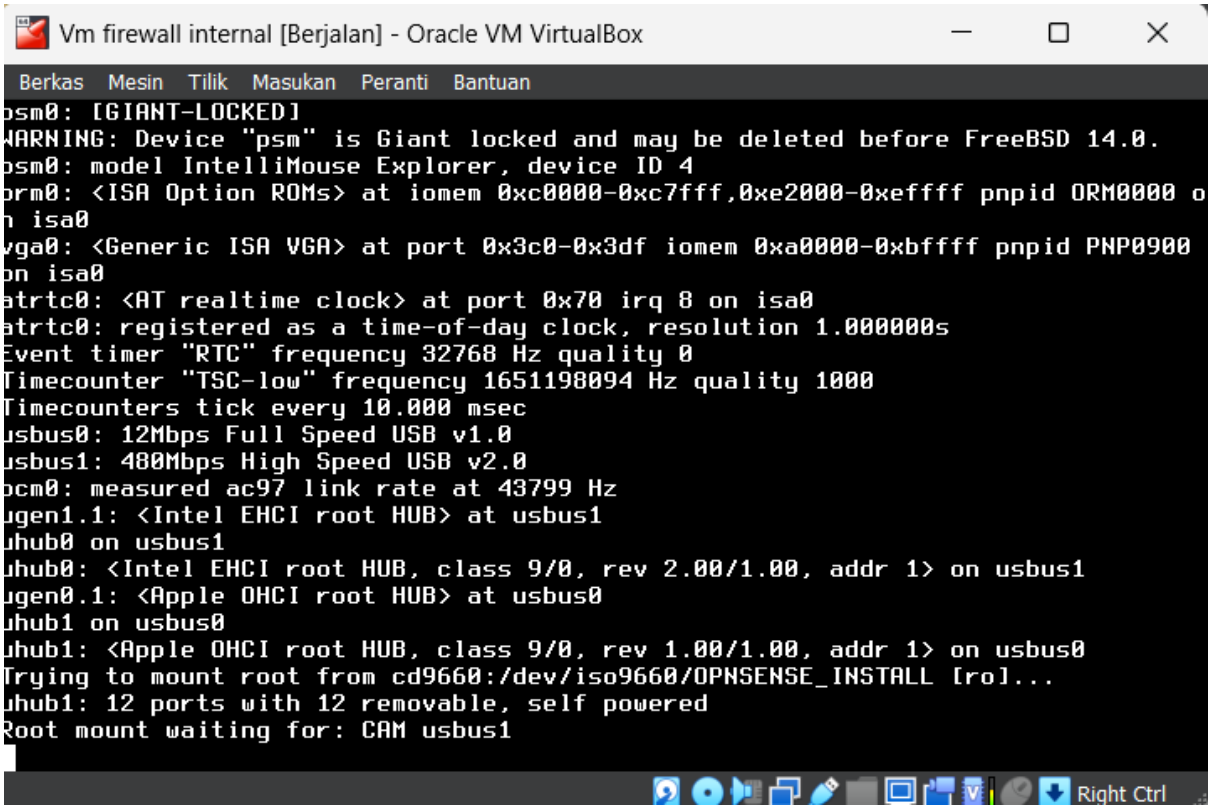


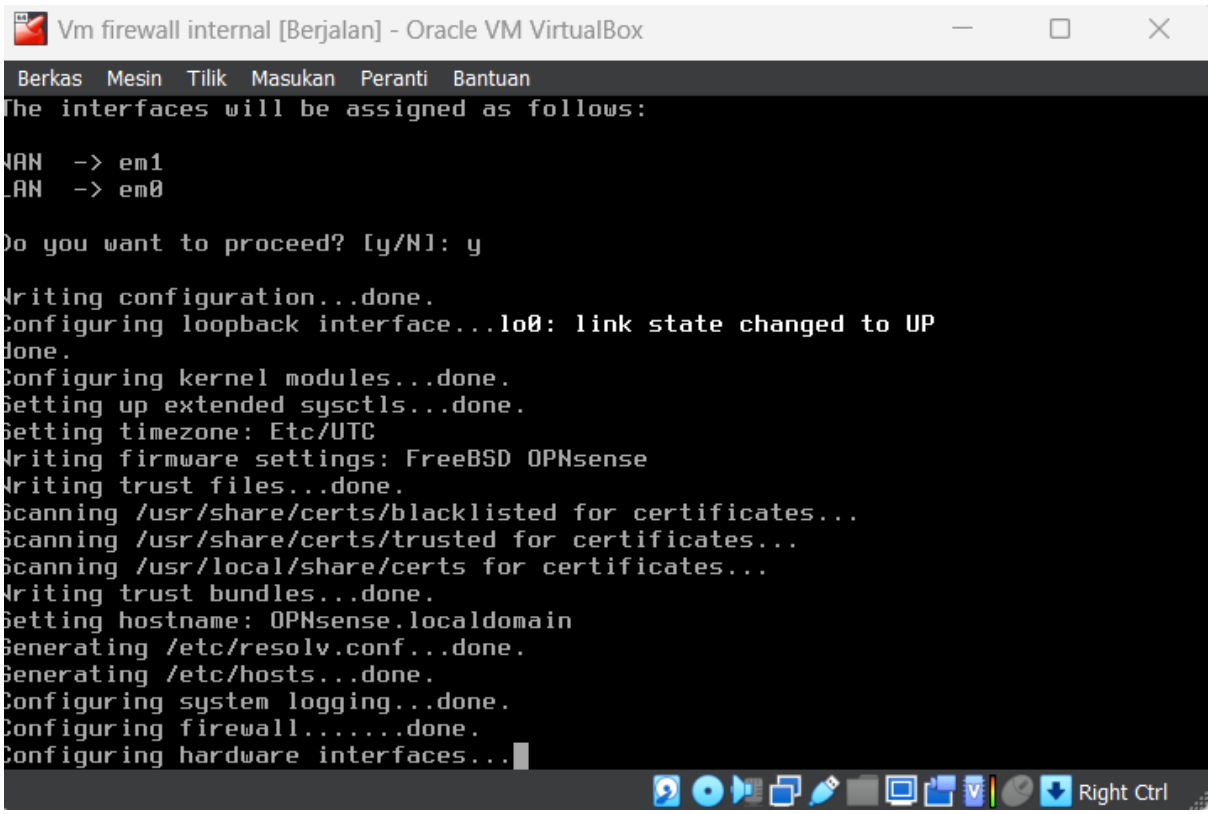
4. Setting jaringan firewall Internal menggunakan jaringan internal pada adaptor 1 intnet2 dan adaptor 2 intnet3

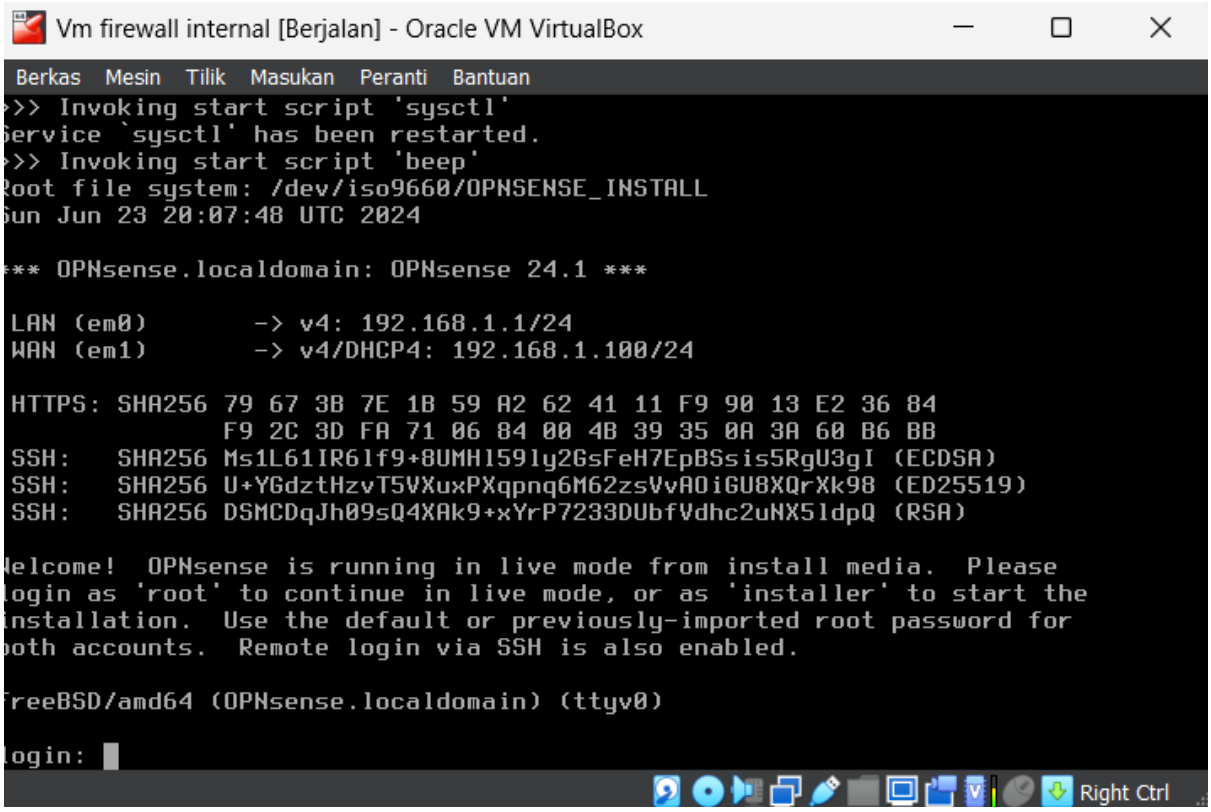

Vm internal firewall - Pengaturan
Umum
Sistem
Tampilan
Penyimpanan
Suara
Jaringan
Port Serial
USB
Folder Bersama
Antarmuka Pengguna
Jaringan
Adaptor 1
Adaptor 2
Adaptor 3
Adaptor 4
Fungsikan Adaptor Jaringan
Tercantol pada:
Jaringan Internal
Nama:
intnet2
Tingkat Lanjut
OK
Batal
Bantuan

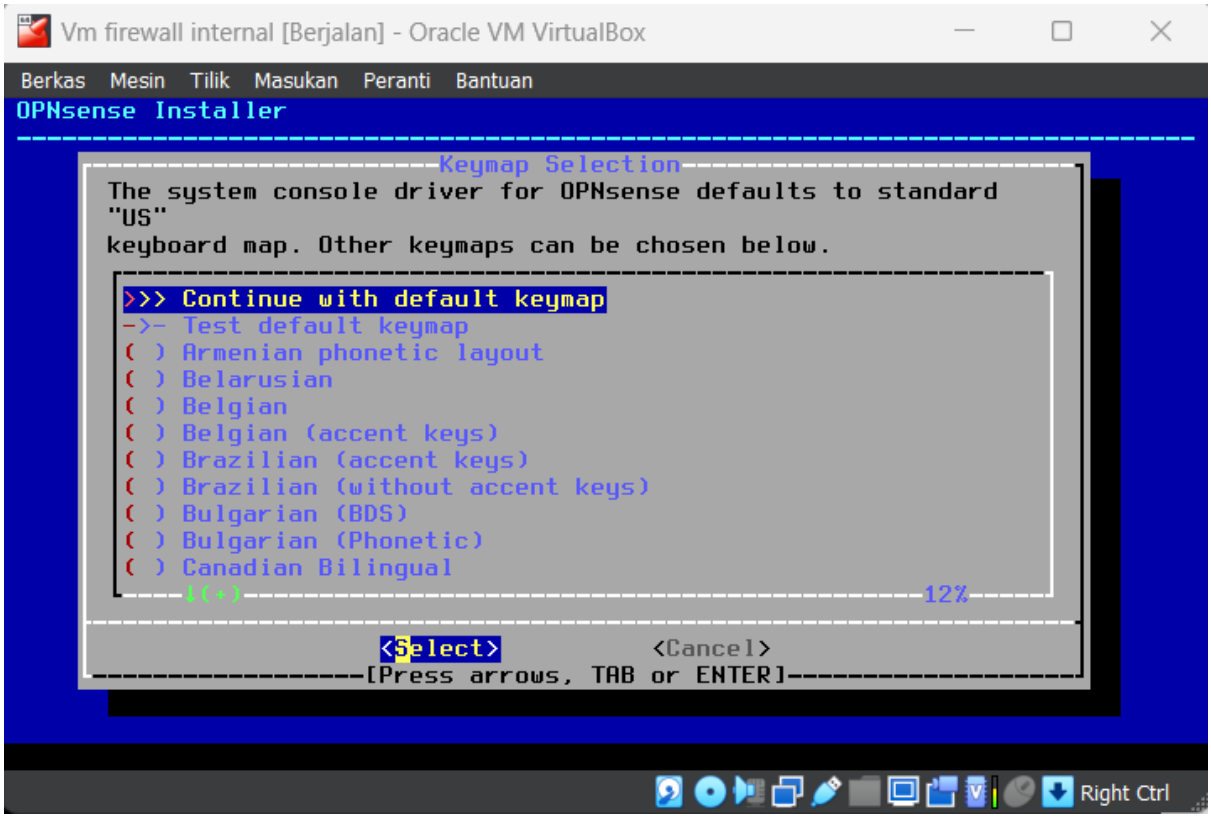

Vm internal firewall - Pengaturan
Umum
Sistem
Tampilan
Penyimpanan
Suara
Jaringan
Port Serial
USB
Folder Bersama
Antarmuka Pengguna
Jaringan
Adaptor 1
Adaptor 2
Adaptor 3
Adaptor 4
Fungsikan Adaptor Jaringan
Tercantol pada:
Jaringan Internal
Nama:
intnet3
Tingkat Lanjut
OK
Batal
Bantuan

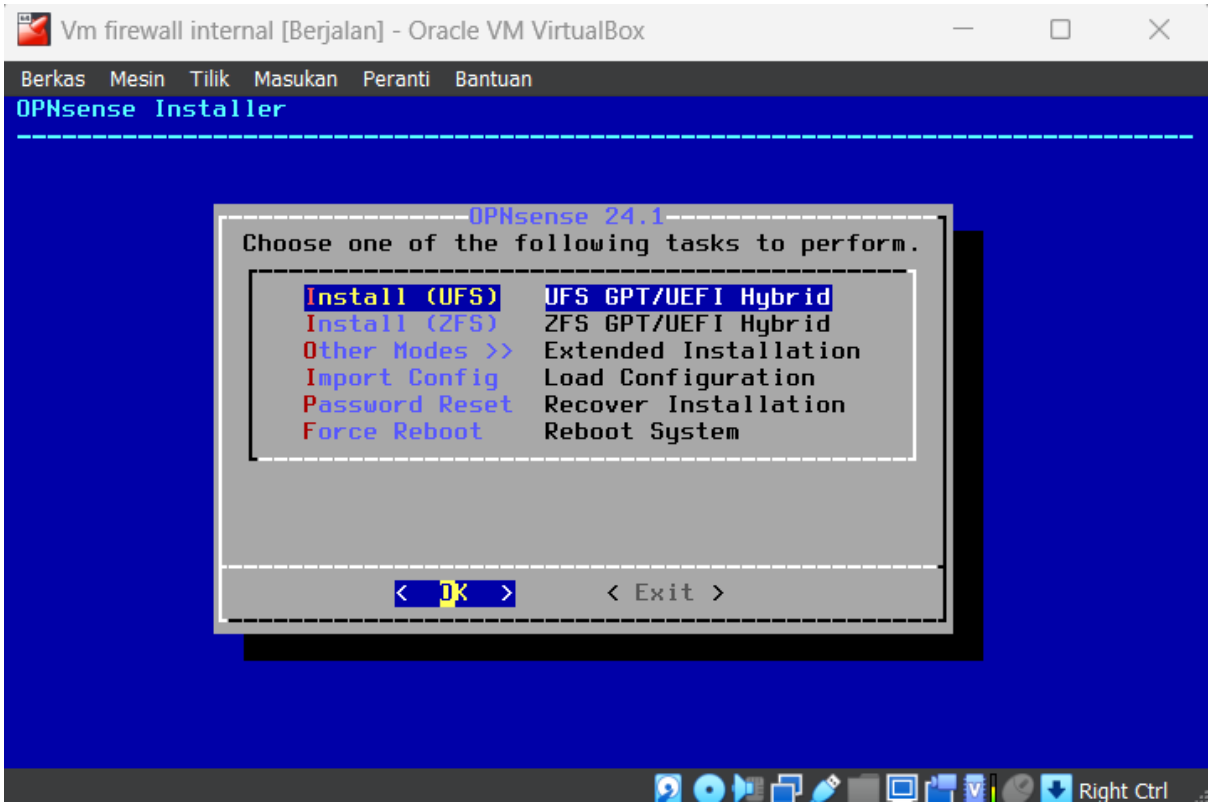
5. Instalasi opnsense

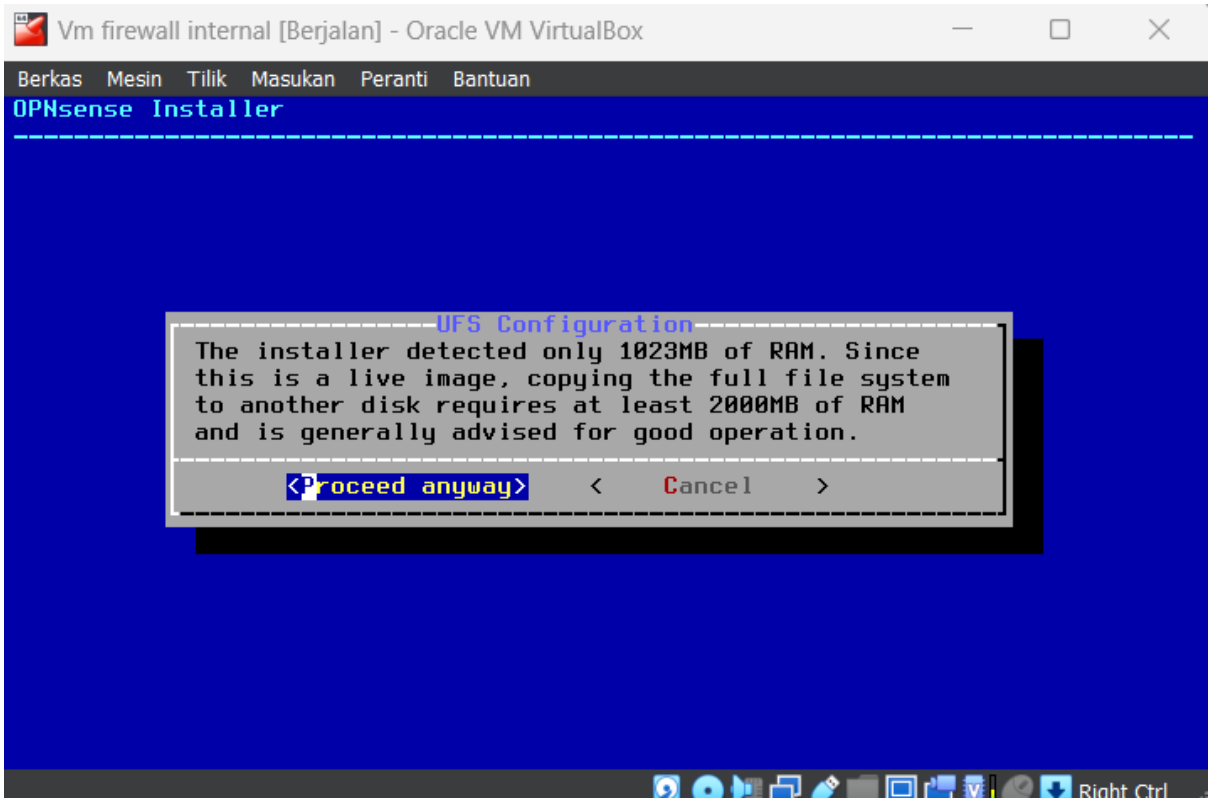


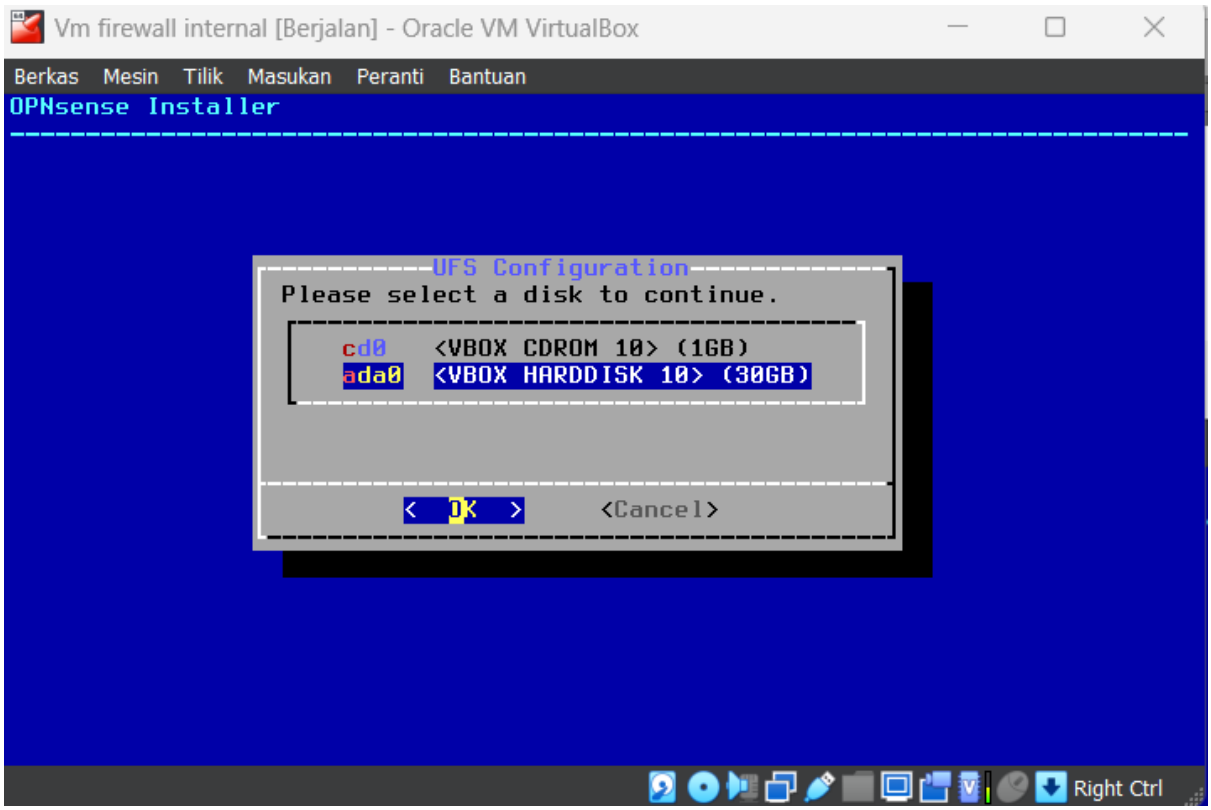


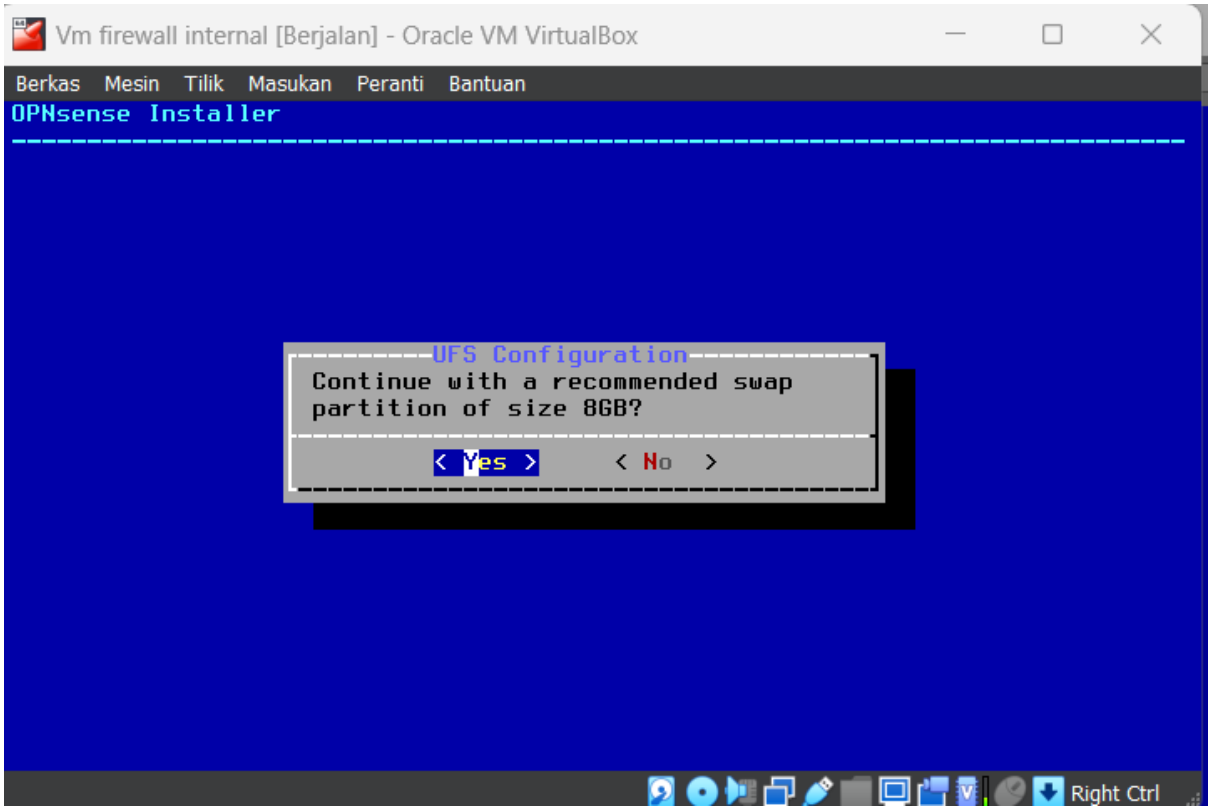

Vm firewall internal [Berjalan] - Oracle VM VirtualBox
Berkas Mesin Tilik Masukan Peranti Bantuan
>>> Invoking start script 'sysctl'
Service `sysctl' has been restarted.
>>> Invoking start script 'beep'
Root file system: /dev/iso9660/OPNSENSE_INSTALL
Sun Jun 23 20:07:48 UTC 2024
*** OPNsense.localdomain: OPNsense 24.1 ***
LAN (em0) -> v4: 192.168.1.1/24
WAN (em1) -> v4/DHCP4: 192.168.1.100/24
HTTPS: SHA256 79 67 3B 7E 1B 59 A2 62 41 11 F9 90 13 E2 36 84
F9 2C 3D FA 71 06 84 00 4B 39 35 0A 3A 60 B6 BB
SSH: SHA256 Ms1L61IR6lf9+8UMHl59ly2GsFeH7EpBSsis5RgU3gI (ECDSA)
SSH: SHA256 U+YGdztHzvT5VXuxPXqpnq6M62zsVvAOiGU8XQrXk98 (ED25519)
SSH: SHA256 DSMCDqJh09sQ4XAk9+xYrP7233DUbfVdhc2uNX5ldpQ (RSA)
Welcome! OPNsense is running in live mode from install media. Please
login as 'root' to continue in live mode, or as 'installer' to start the
installation. Use the default or previously-imported root password for
both accounts. Remote login via SSH is also enabled.
FreeBSD/amd64 (OPNsense.localdomain) (ttyv0)
login:
Right Ctrl

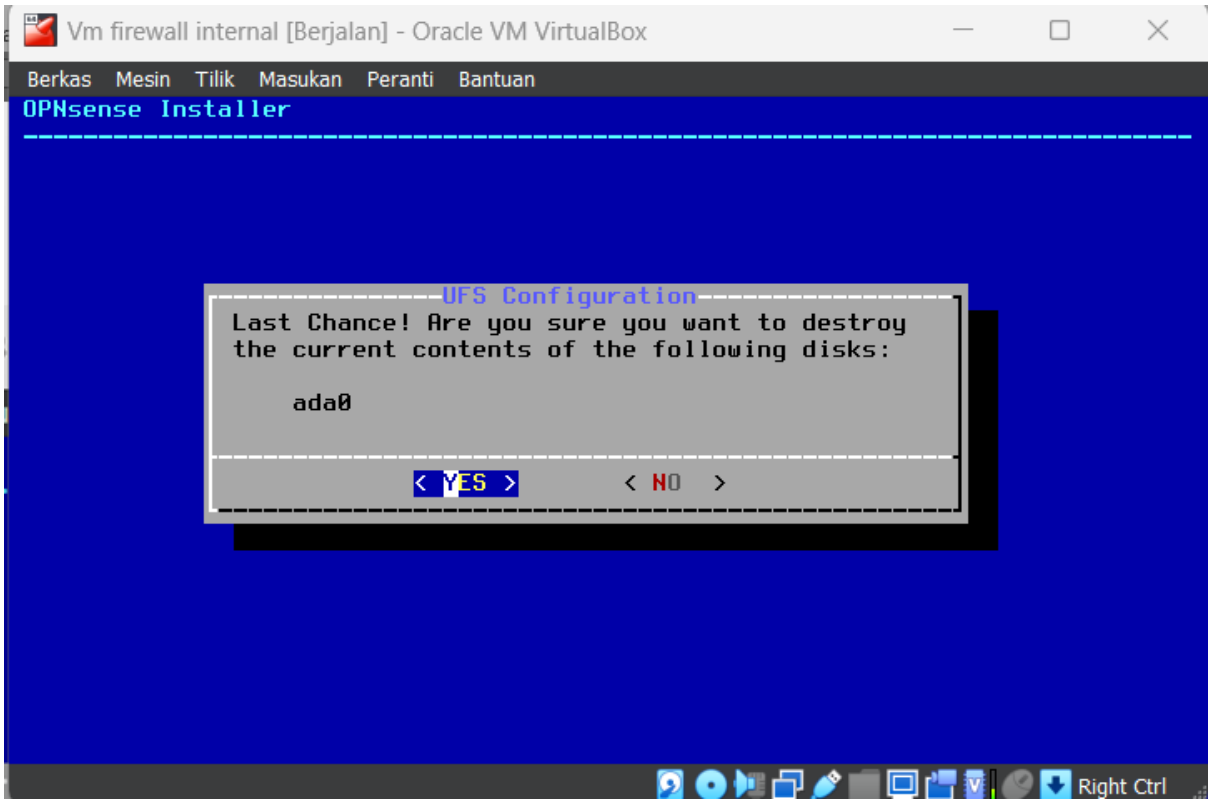

Vm firewall internal [Berjalan] - Oracle VM VirtualBox
Berkas Mesin Tilik Masukan Peranti Bantuan
OPNsense Installer
Keymap Selection
The system console driver for OPNsense defaults to standard
"US"
keyboard map. Other keymaps can be chosen below.
>>> Continue with default keymap
->- Test default keymap
( ) Armenian phonetic layout
( ) Belarusian
( ) Belgian
( ) Belgian (accent keys)
( ) Brazilian (accent keys)
( ) Brazilian (without accent keys)
( ) Bulgarian (BDS)
( ) Bulgarian (Phonetic)
( ) Canadian Bilingual
12%
<Select>
<Cancel>
[Press arrows, TAB or ENTER]
Right Ctrl

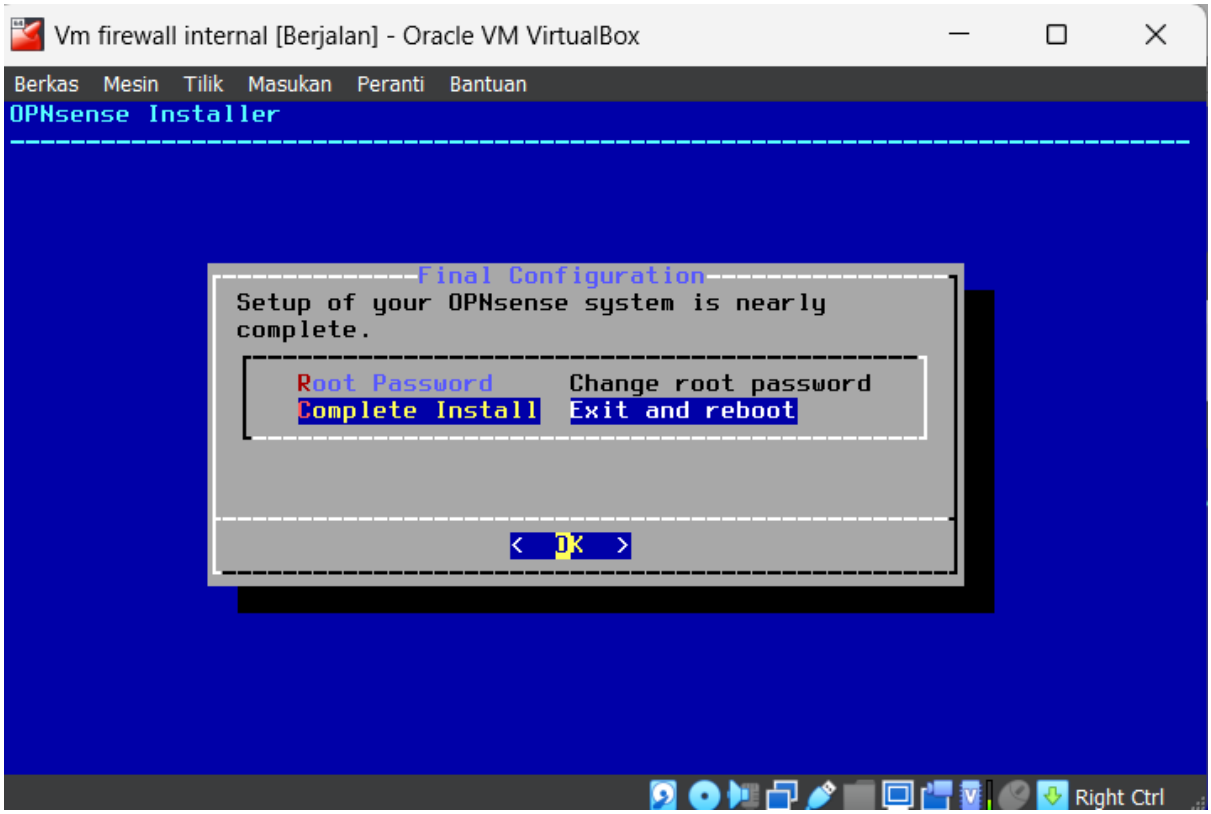

Vm firewall internal [Berjalan] - Oracle VM VirtualBox
Berkas Mesin Tilik Masukan Peranti Bantuan
OPNsense Installer
OPNsense 24.1
Choose one of the following tasks to perform.
Install (UFS) UFS GPT/UEFI Hybrid
Install (ZFS) ZFS GPT/UEFI Hybrid
Other Modes >> Extended Installation
Import Config Load Configuration
Password Reset Recover Installation
Force Reboot Reboot System
< OK >
< Exit >
Right Ctrl


Vm firewall internal [Berjalan] - Oracle VM VirtualBox
Berkas Mesin Tilik Masukan Peranti Bantuan
OPNsense Installer
UFS Configuration
The installer detected only 1023MB of RAM. Since
this is a live image, copying the full file system
to another disk requires at least 2000MB of RAM
and is generally advised for good operation.
<Proceed anyway> < Cancel >
Right Ctrl


Vm firewall internal [Berjalan] - Oracle VM VirtualBox
Berkas Mesin Tilik Masukan Peranti Bantuan
OPNsense Installer
UFS Configuration
Please select a disk to continue.
cd0 <VBOX CDROM 10> (1GB)
ada0 <VBOX HARDDISK 10> (30GB)
< OK > <Cancel>
Right Ctrl

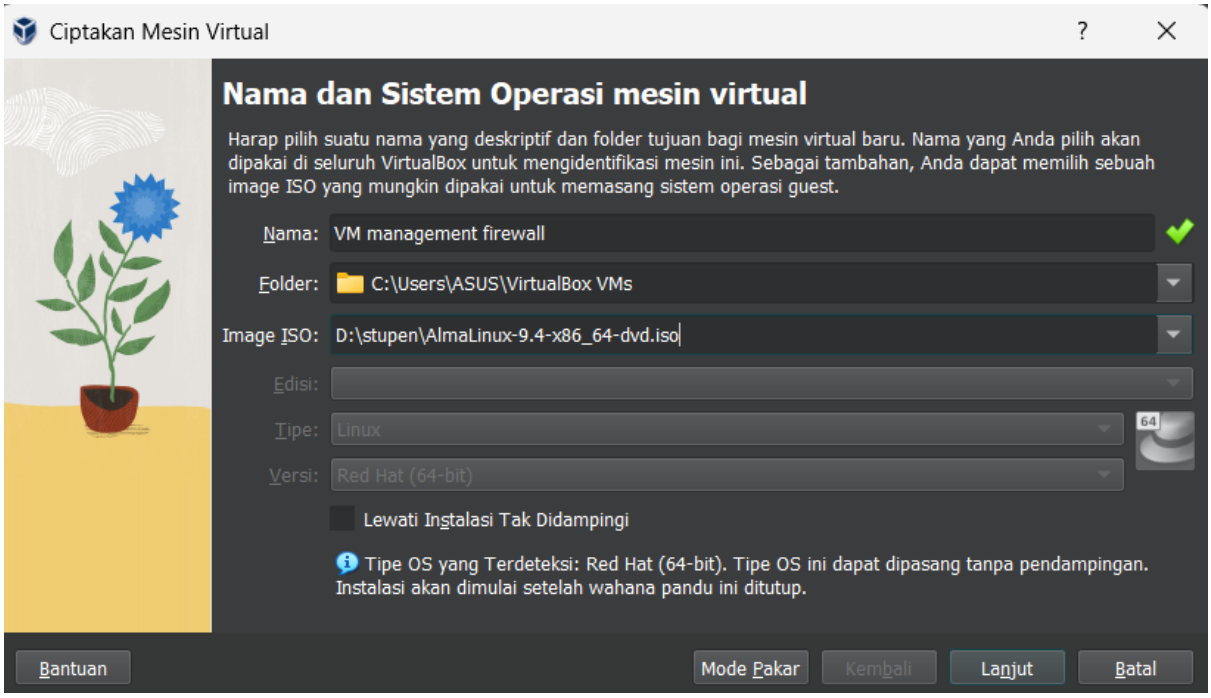

Vm firewall internal [Berjalan] - Oracle VM VirtualBox
Berkas Mesin Tilik Masukan Peranti Bantuan
OPNsense Installer
UFS Configuration
Continue with a recommended swap partition of size 8GB?
< Yes >
< No >
Right Ctrl


Vm firewall internal [Berjalan] - Oracle VM VirtualBox
Berkas Mesin Tilik Masukan Peranti Bantuan
OPNsense Installer
UFS Configuration
Last Chance! Are you sure you want to destroy the current contents of the following disks:
ada0
< YES >
< NO >
Right Ctrl

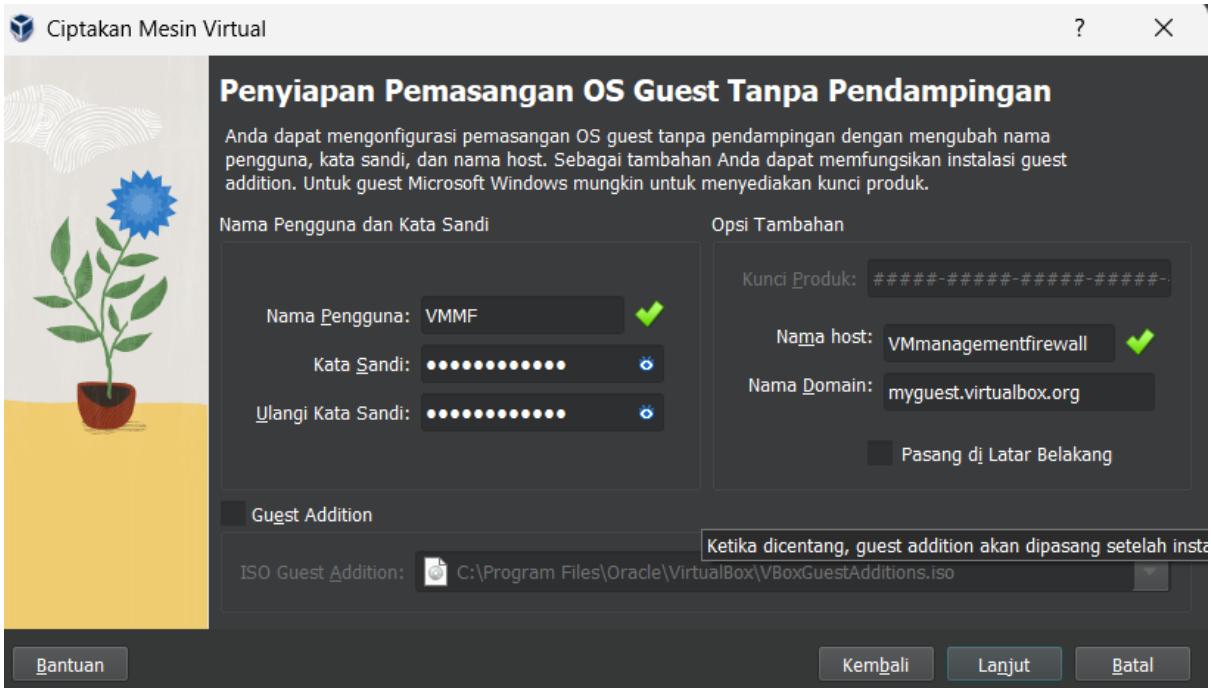

Vm firewall internal [Berjalan] - Oracle VM VirtualBox
Berkas Mesin Tilik Masukan Peranti Bantuan
OPNsense Installer
Final Configuration
Setup of your OPNsense system is nearly complete.
Root Password
Change root password
Complete Install
Exit and reboot
< OK >
Right Ctrl

V. Install Alma linux – VM Management Firewall

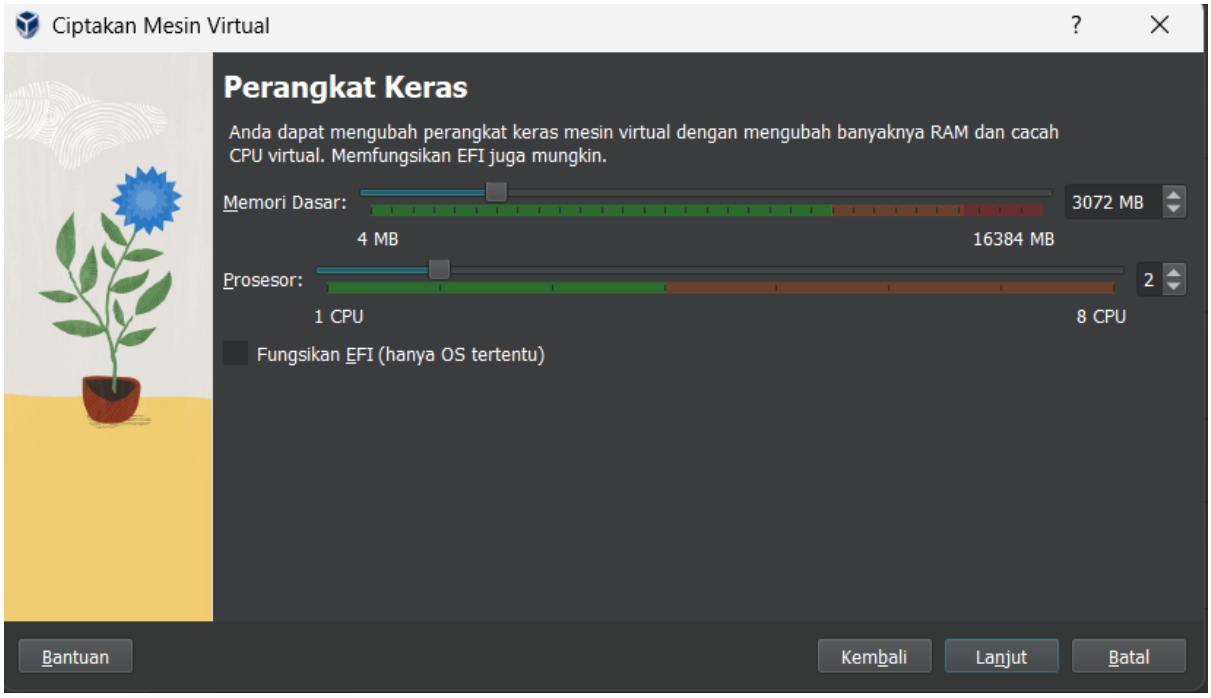
1. Install vm management firewall menggunakan alma linux



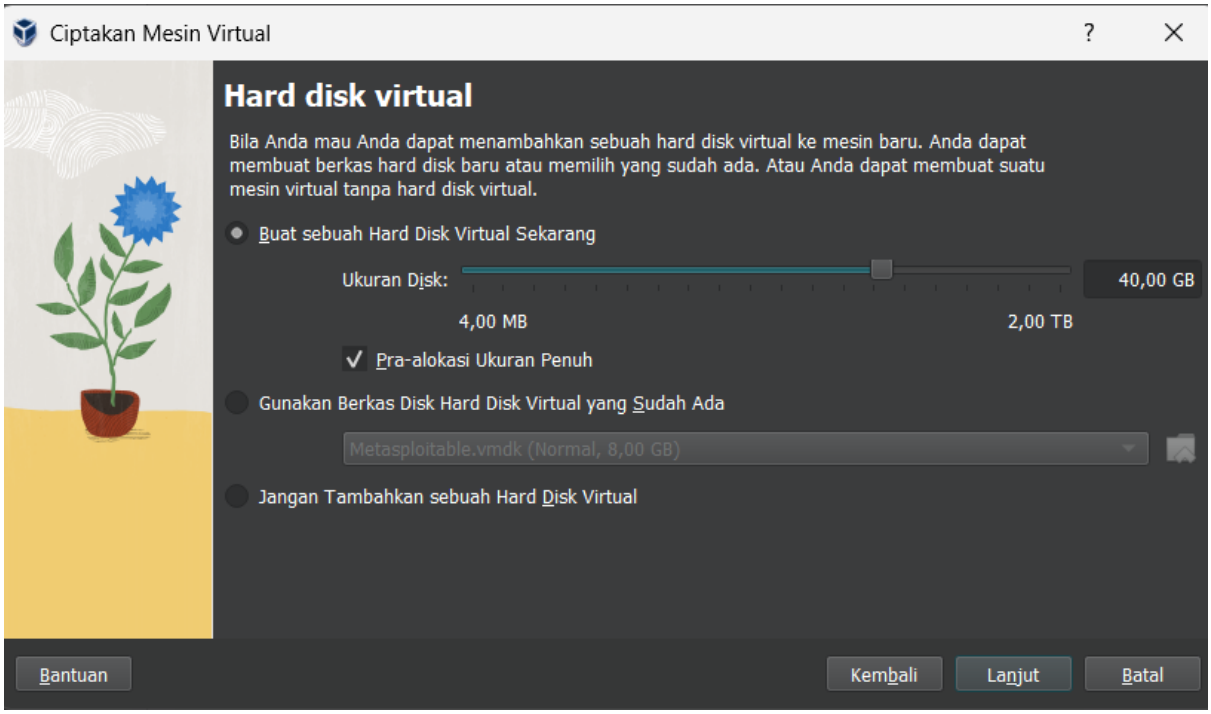
2. Atur username dan password dan nama host



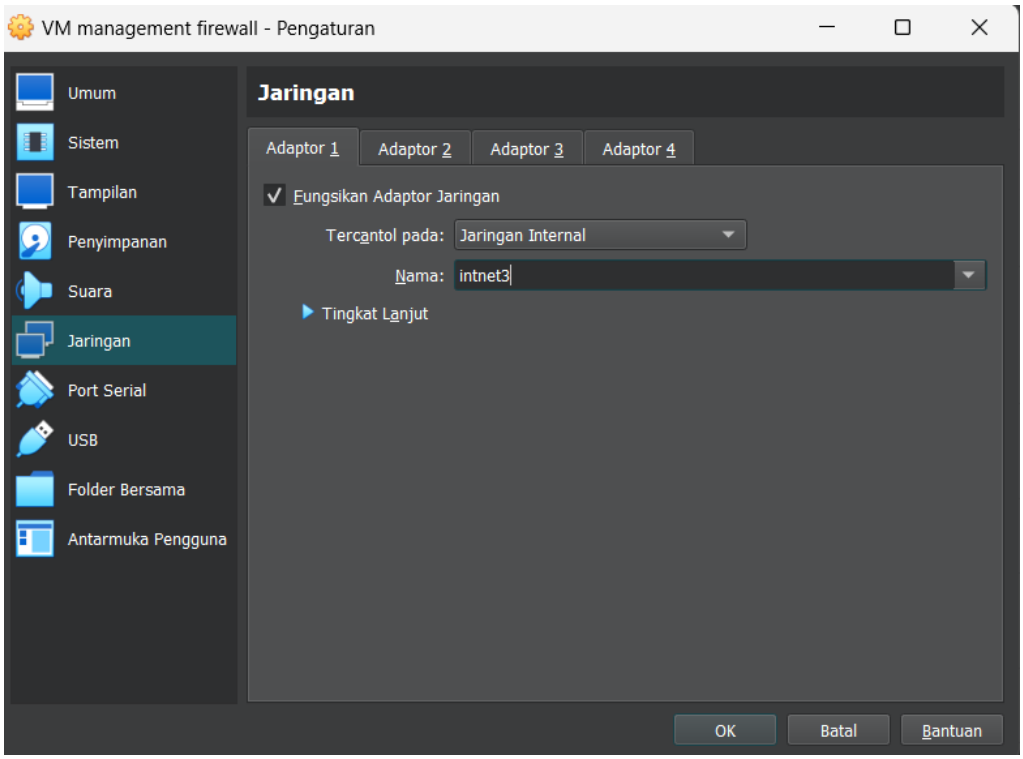
3. Atur ram dan cpu yang akan digunakan



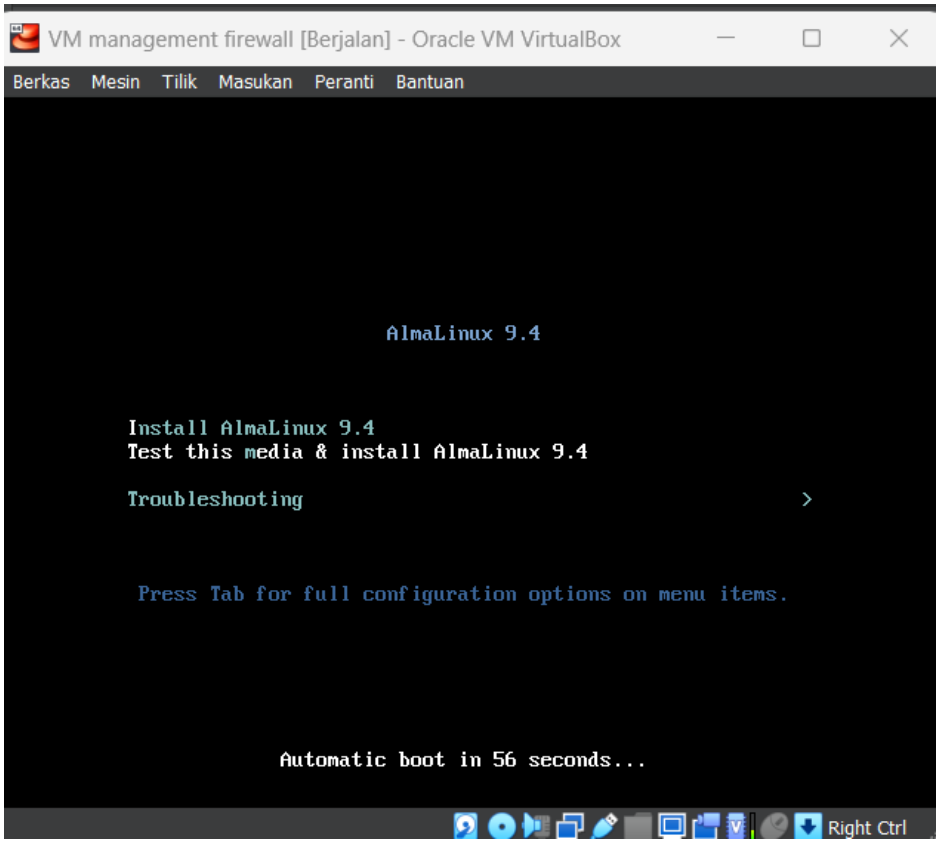
4. Atur penyimpanan yang akan digunakan



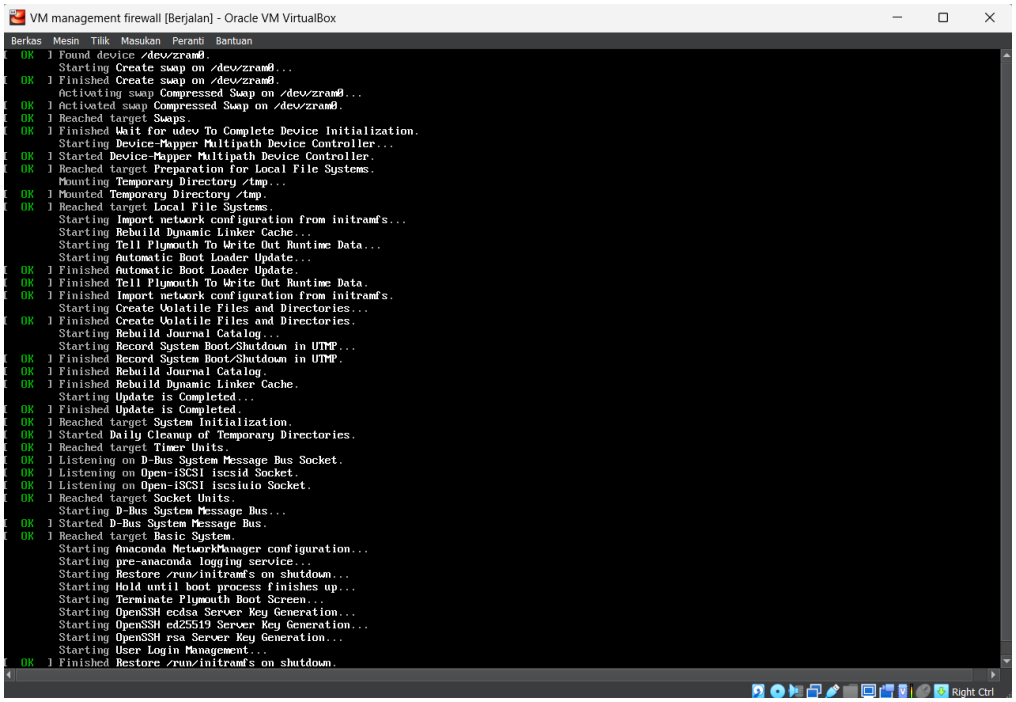
5. Atur jaringan yang akan digunakan pada adaptor 1 menggunakan jaringan internal intnet3 yang akan terhubung dengan adaptor 2 intnet3 internal firewall



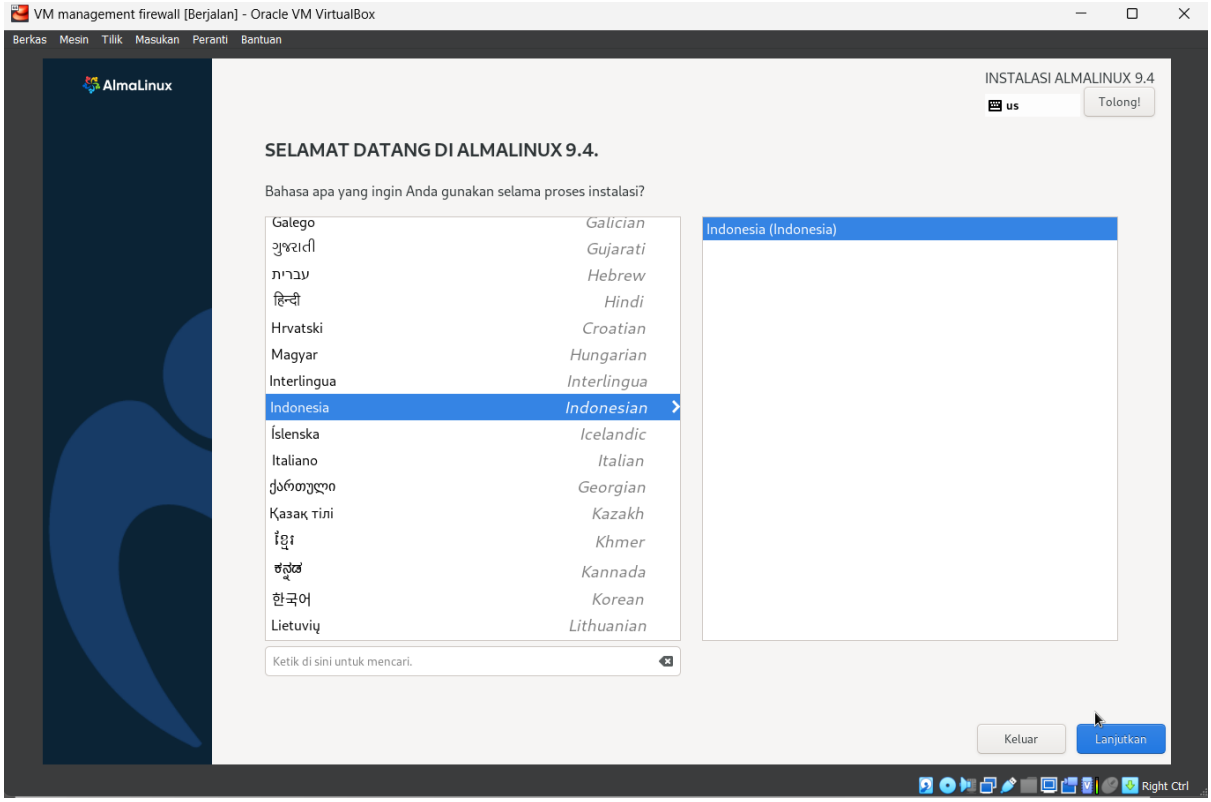
6. Insttalasi alma linux pilih install Almalinux 9.4



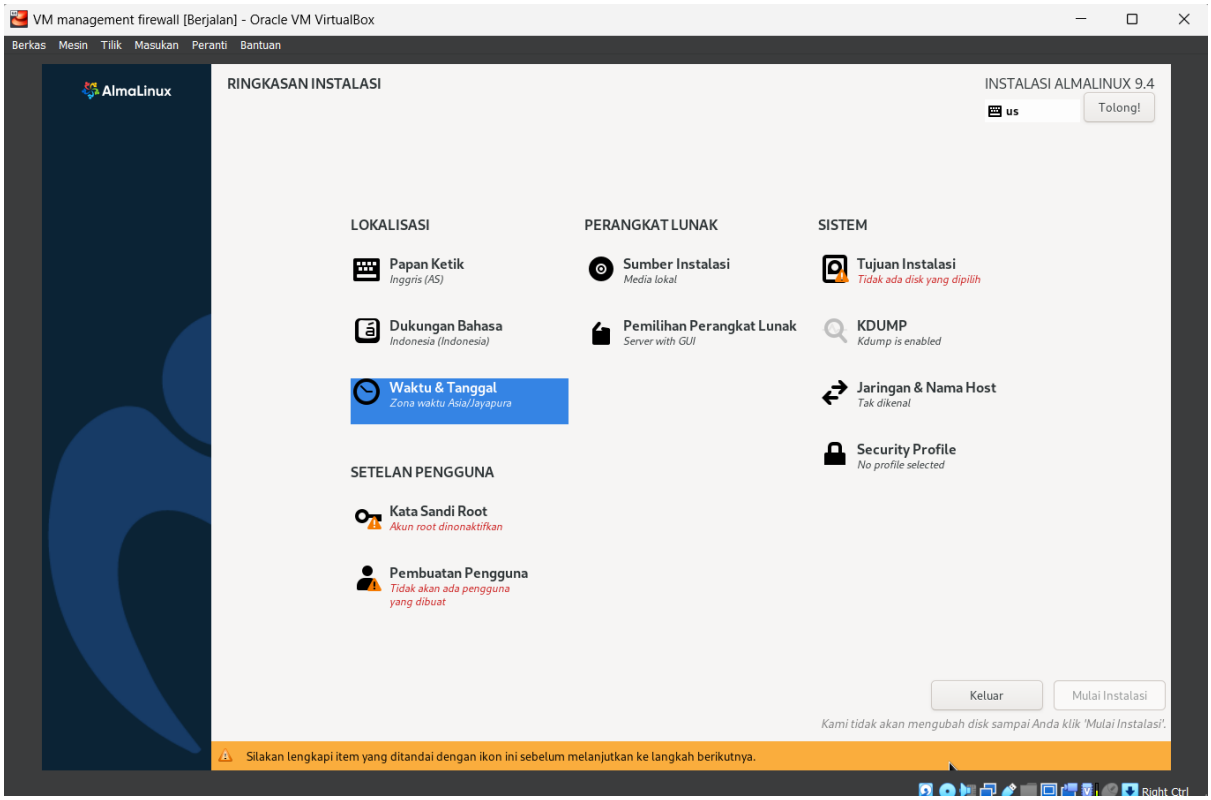
7. Tunggu sedang proses pengecekan os



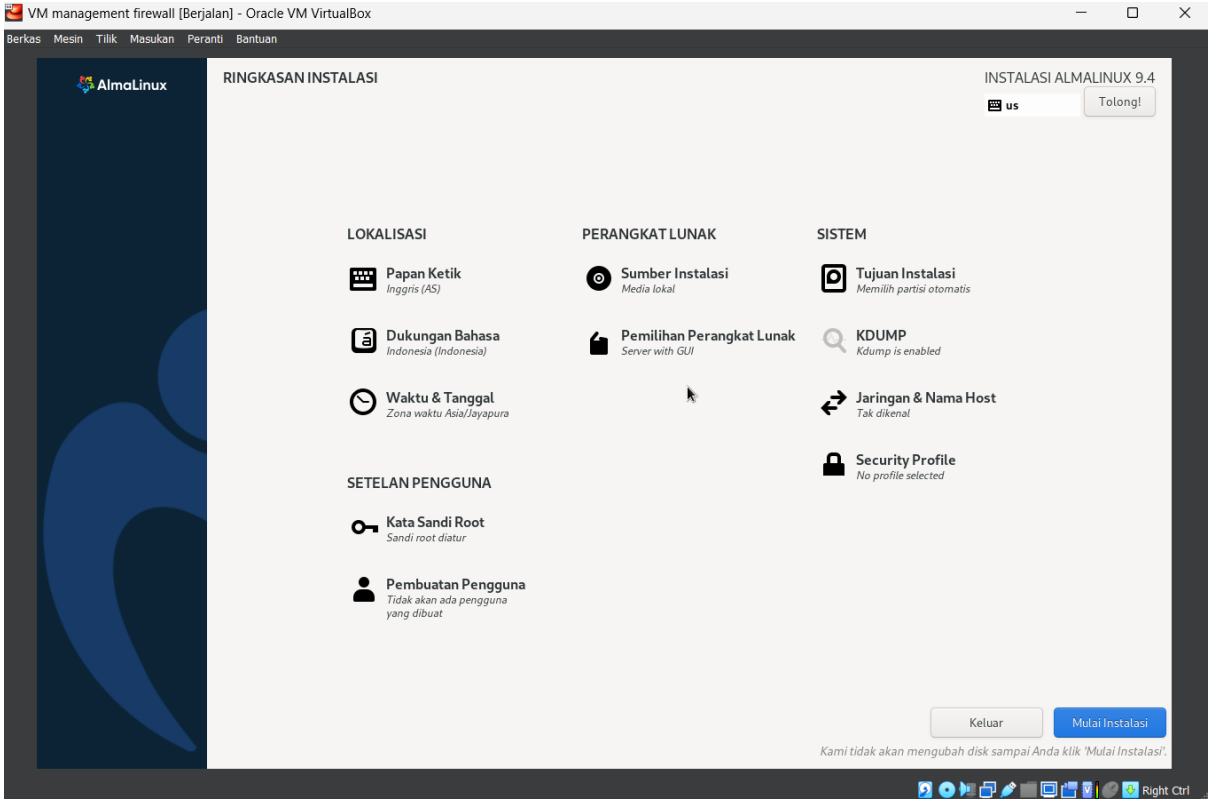
8. Pilih bahasa indonesia dan klik lanjutkan



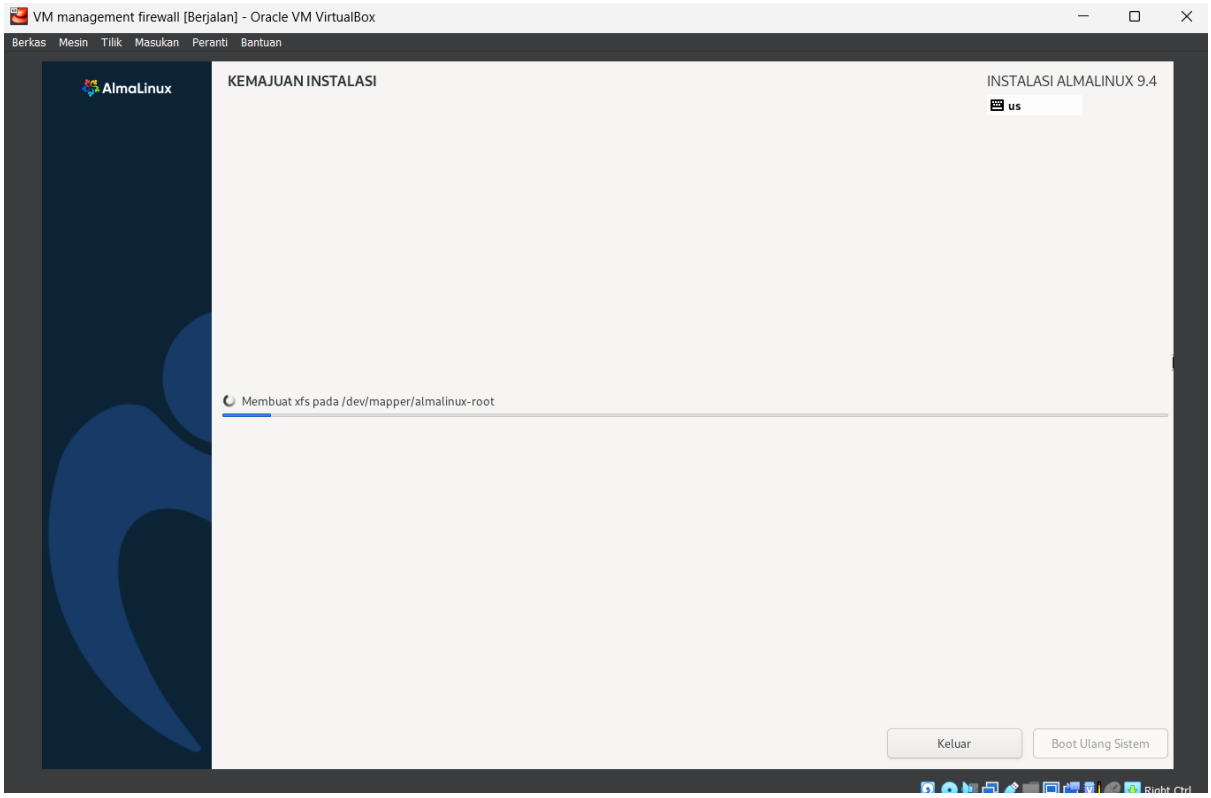
9. Atur kata sandi admin/root dan atur disk penyimpanan yg digunakan



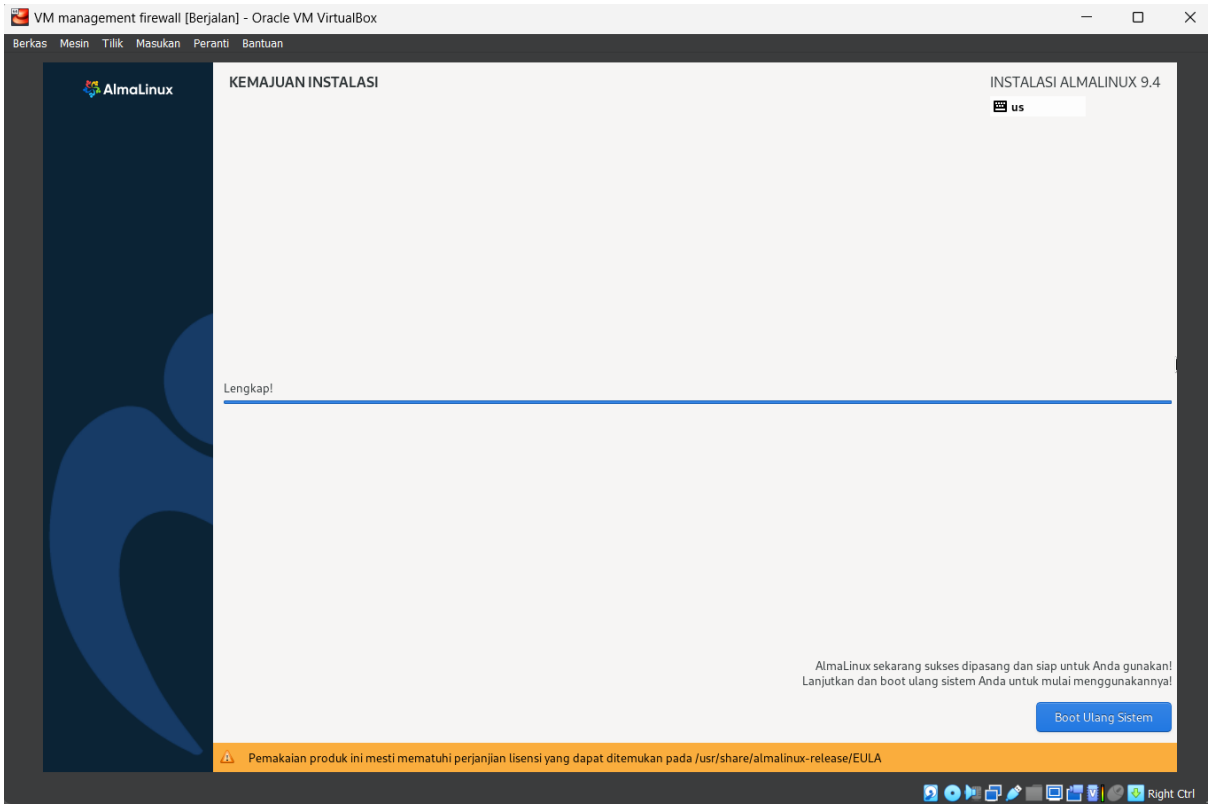
10. Jika sudah klik mulai instalasi



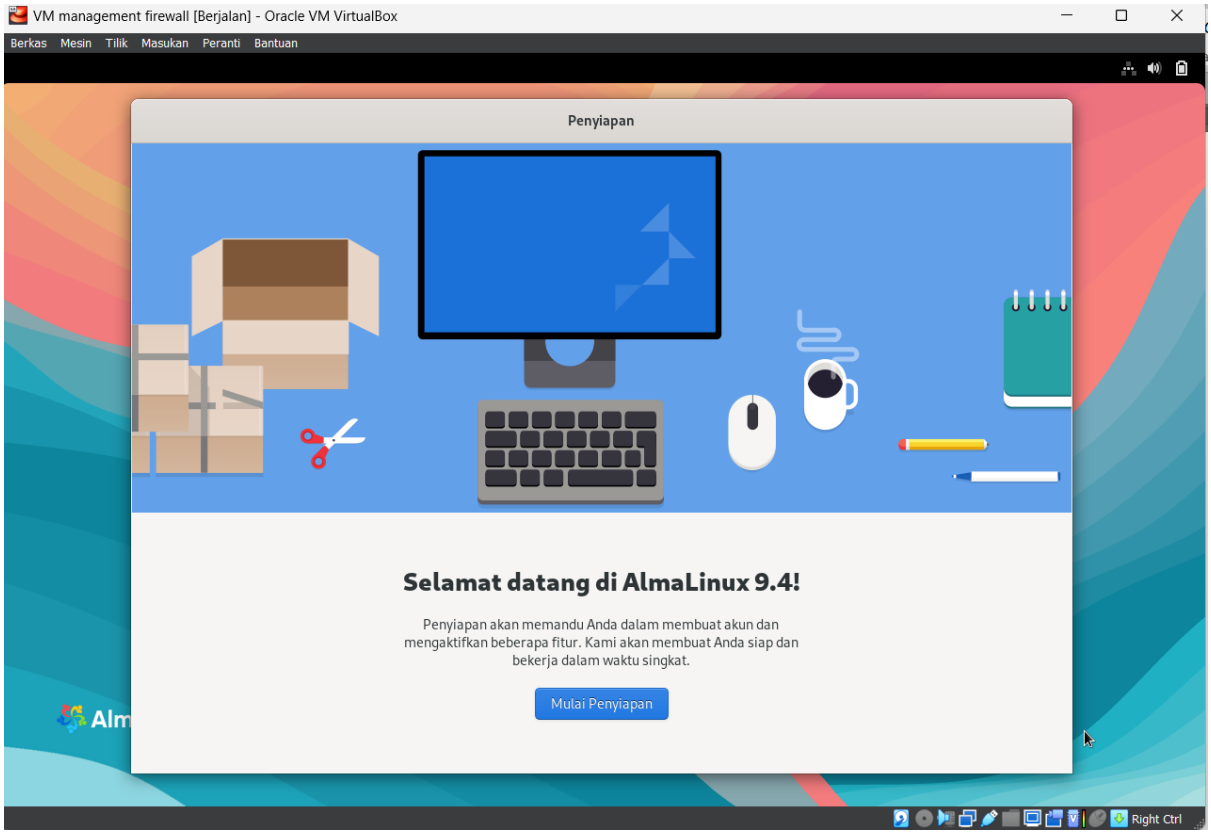
11. Tunggu instalasi selesai



12. Jika sudah selesai klik boot ulang sistem

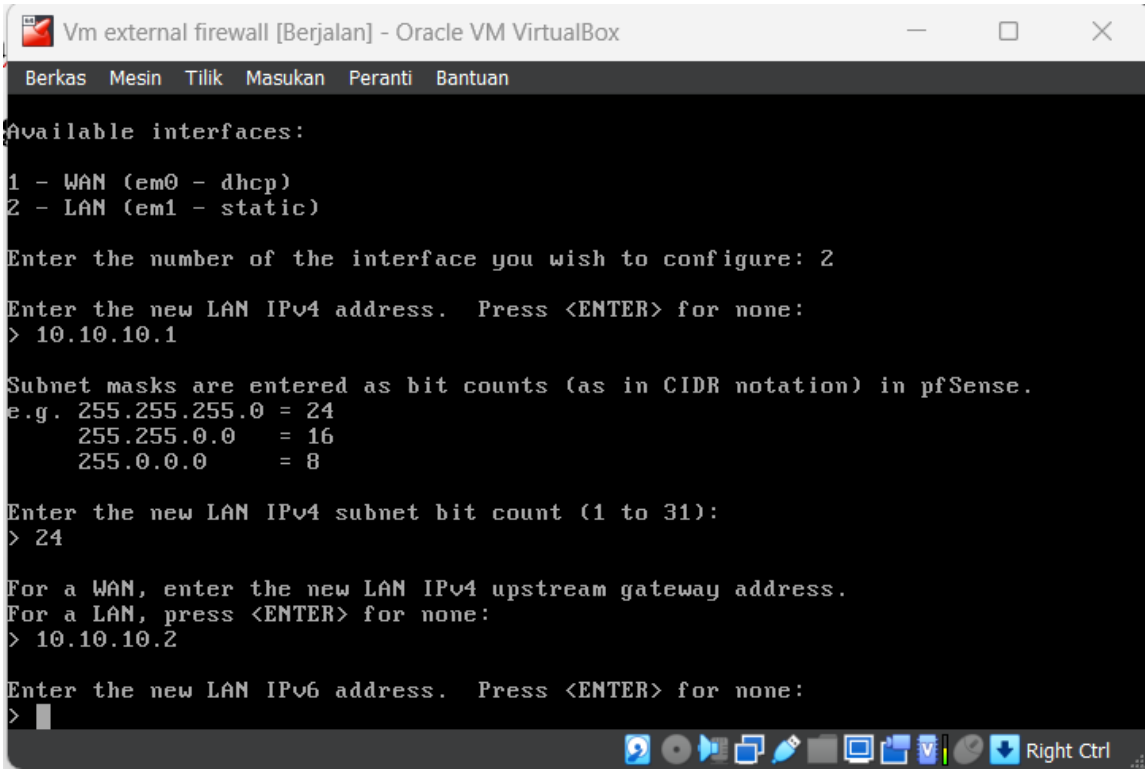


13. Alma linux berhasil ter install

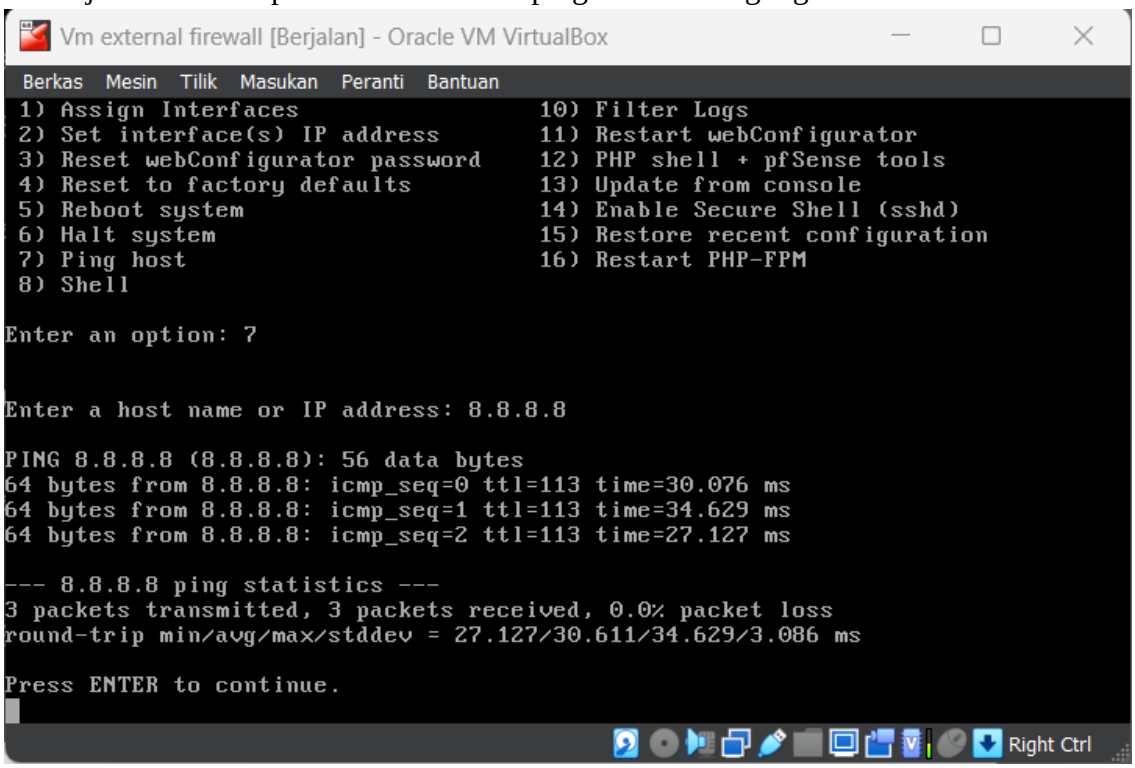


VI. Konfigurasi firewall external dengan laptop dan internet

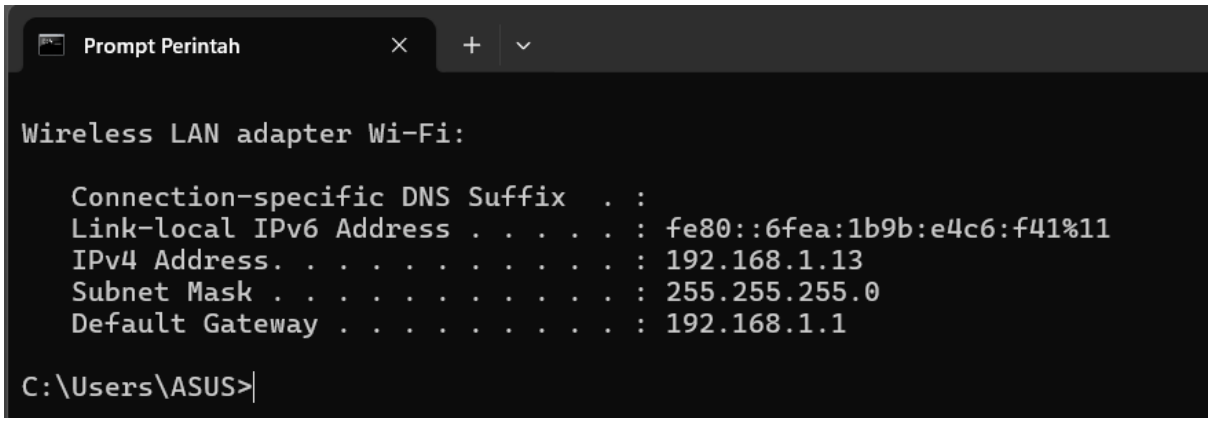
1. Mengatur interface pada external firewall untuk wan menggunakan dhcp nat network dan pada LAN menggunakan static dengan ip address 10.10.10.1/24 dan gateway 10.10.10.2



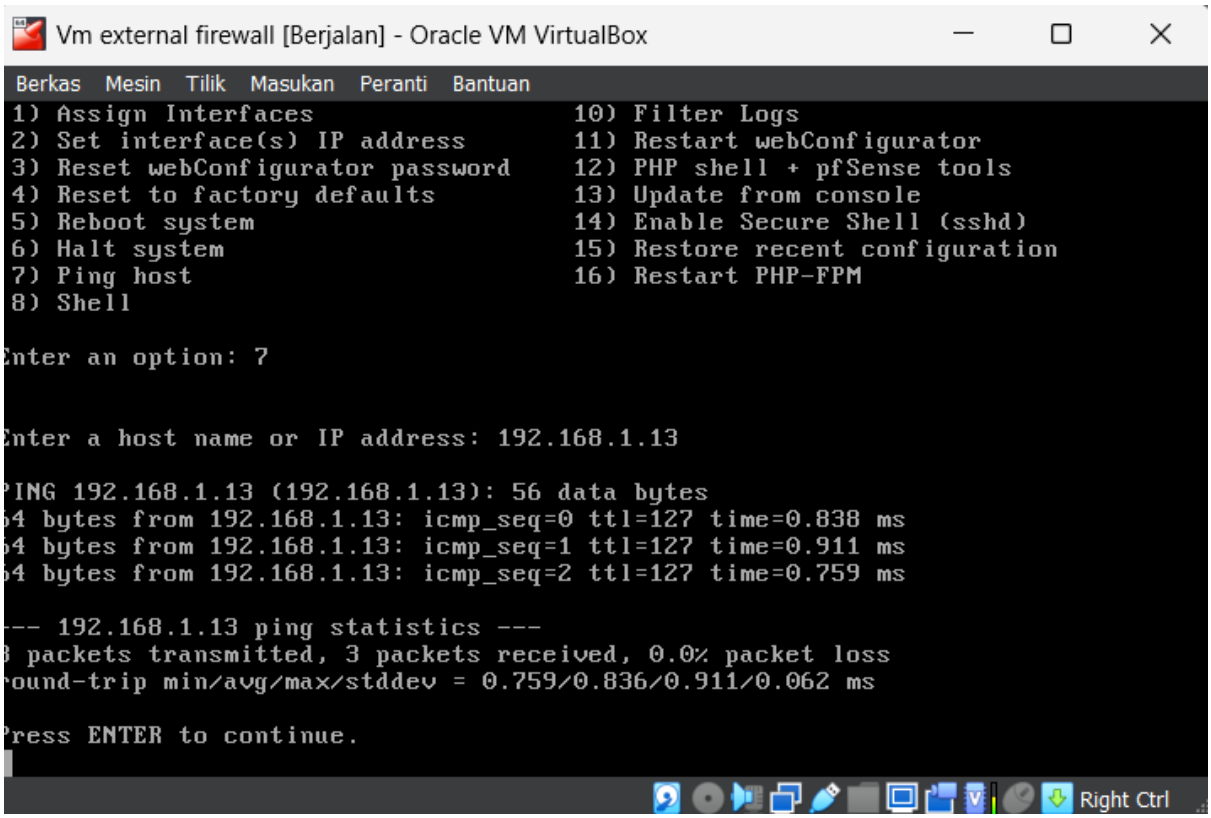
2. Uji konektifitas pada external untuk ping 8.8.8.8 dns google.com



3. Uji konektifitas dengan jaringan laptop menggunakan ping dari eksternal firewall

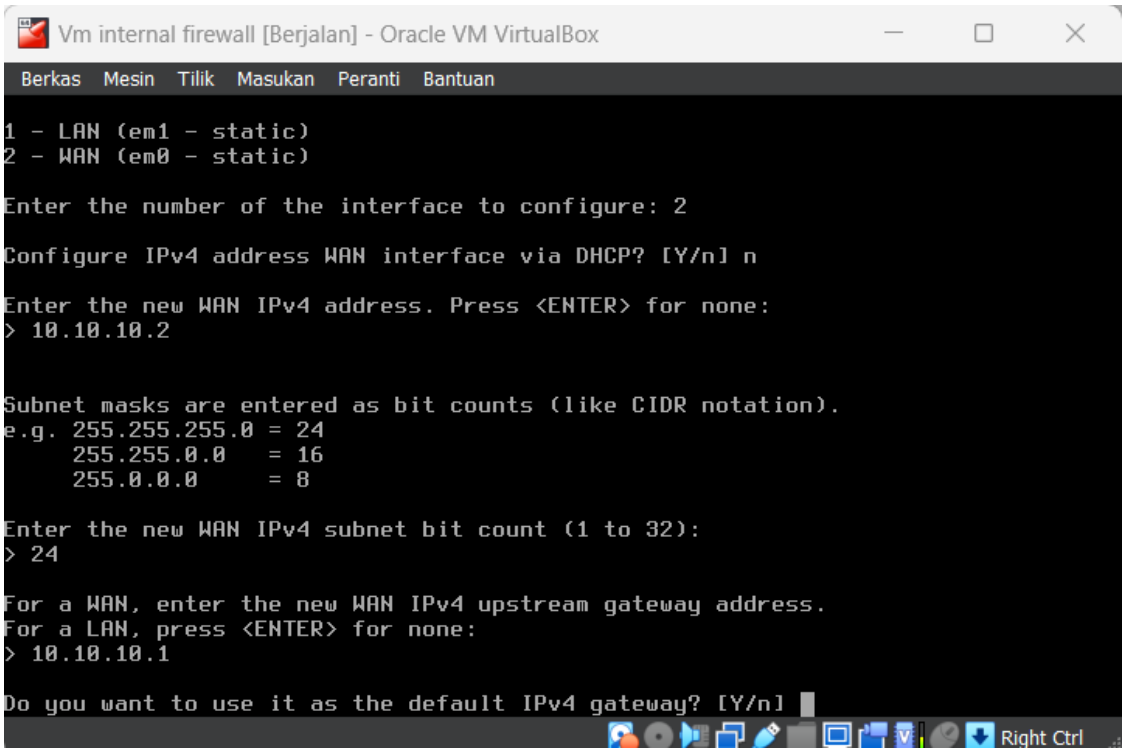


(ip address laptop)

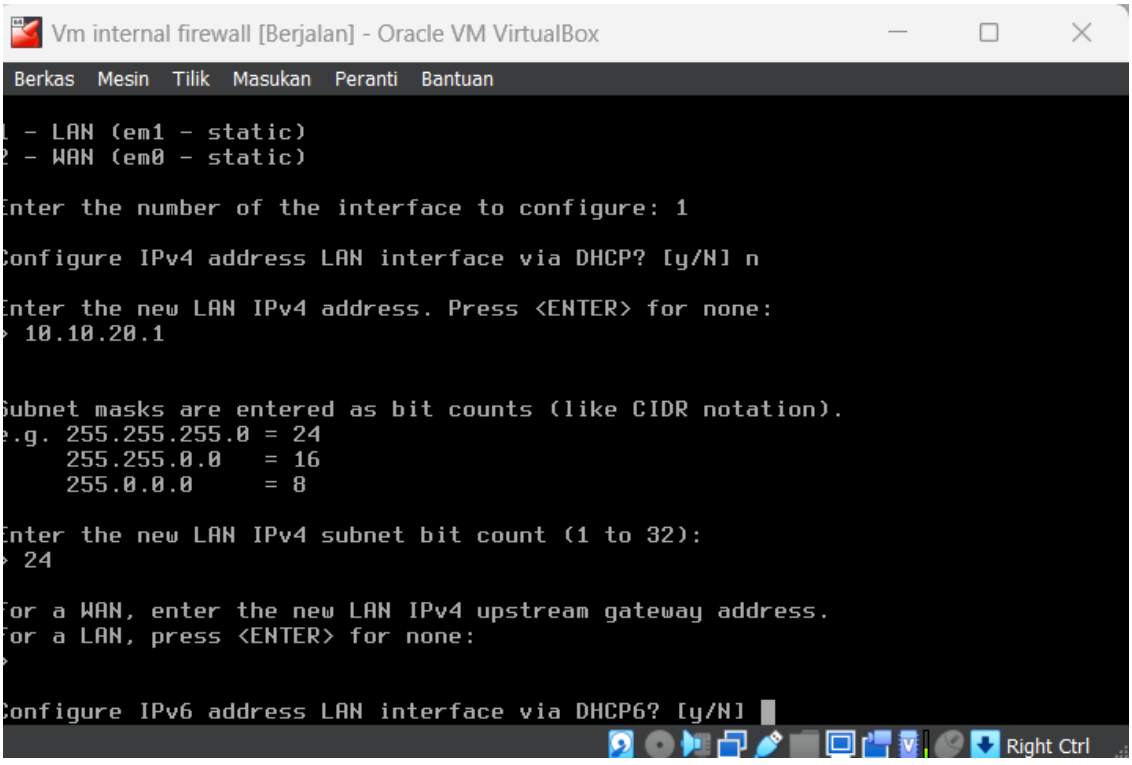


VII. Konfigurasi firewall Internal dengan firewall eksternal

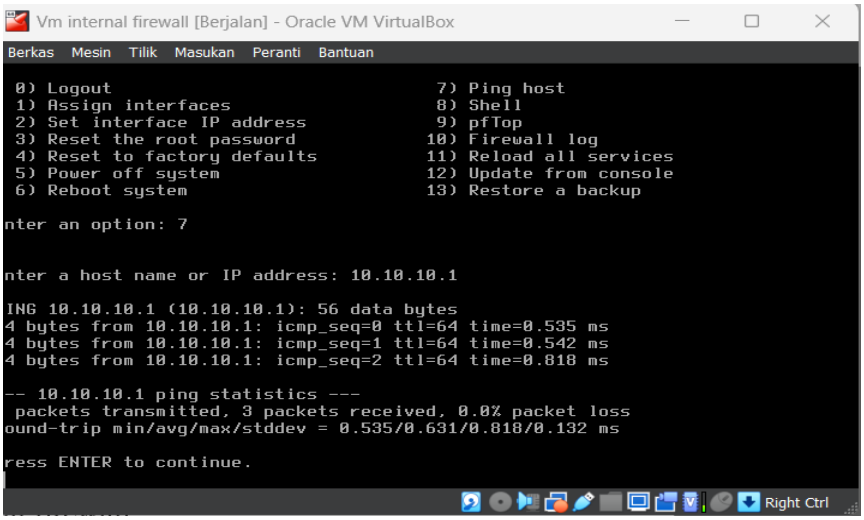
1. Mengatur interface pada wan interface internal firewall memasukan ip addres submask dan gateway untuk terhubung dengan eksternal firewall



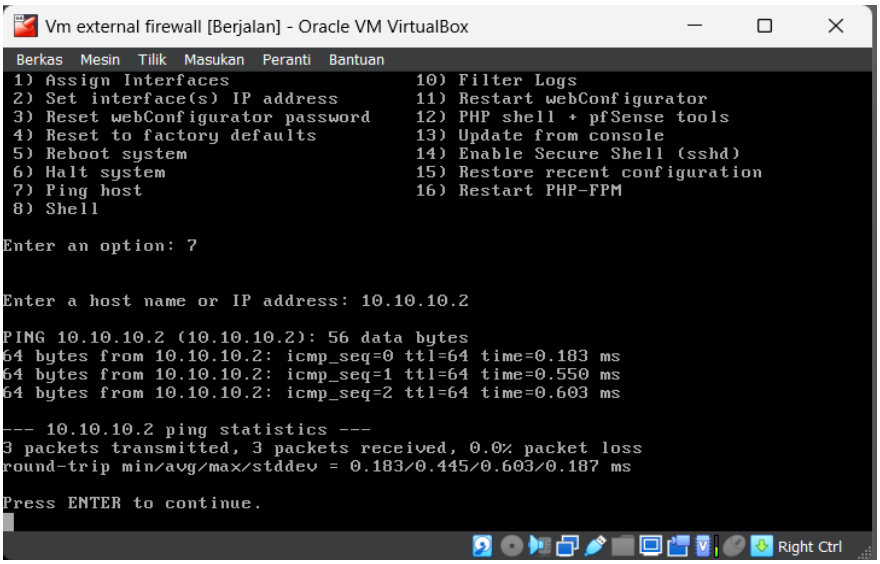
2. Mengatur interface pada LAN interface internal firewall memasukan ip addres submask



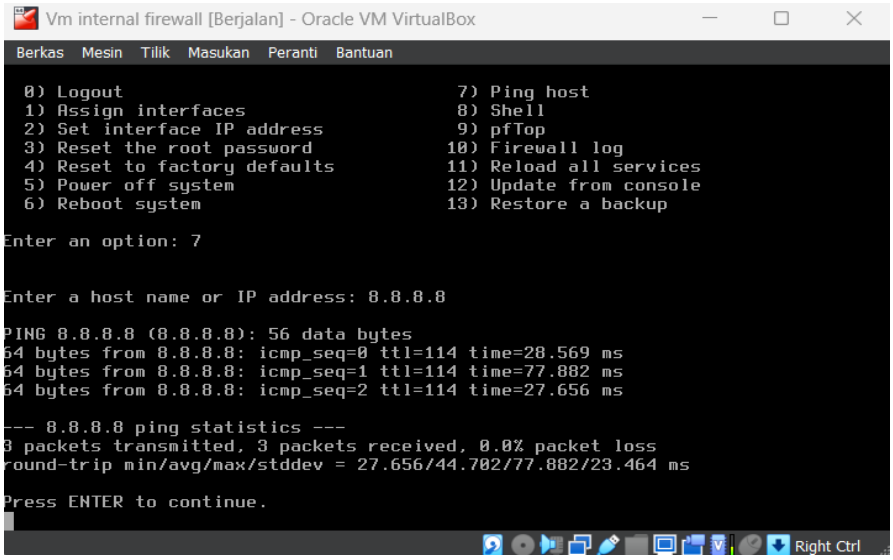
3. Uji konektifitas dari internal firewall ke eksternal firewall



4. Uji konektifitas dari eksternal firewall ke internal firewall

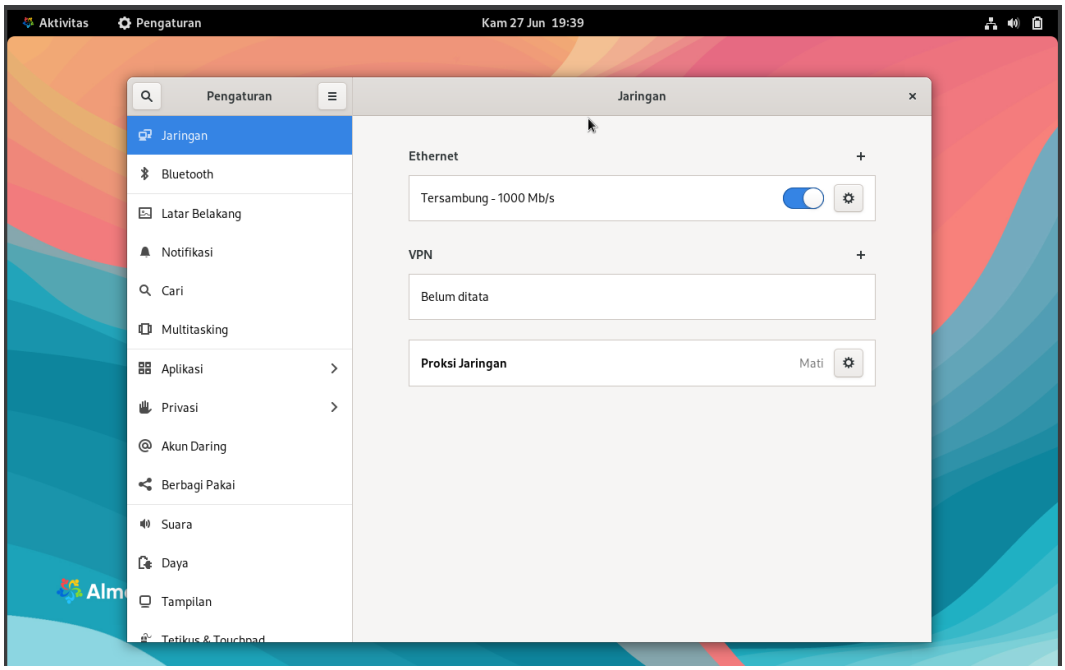


5. Uji konektifitas dari internal firewall ke dns google.com

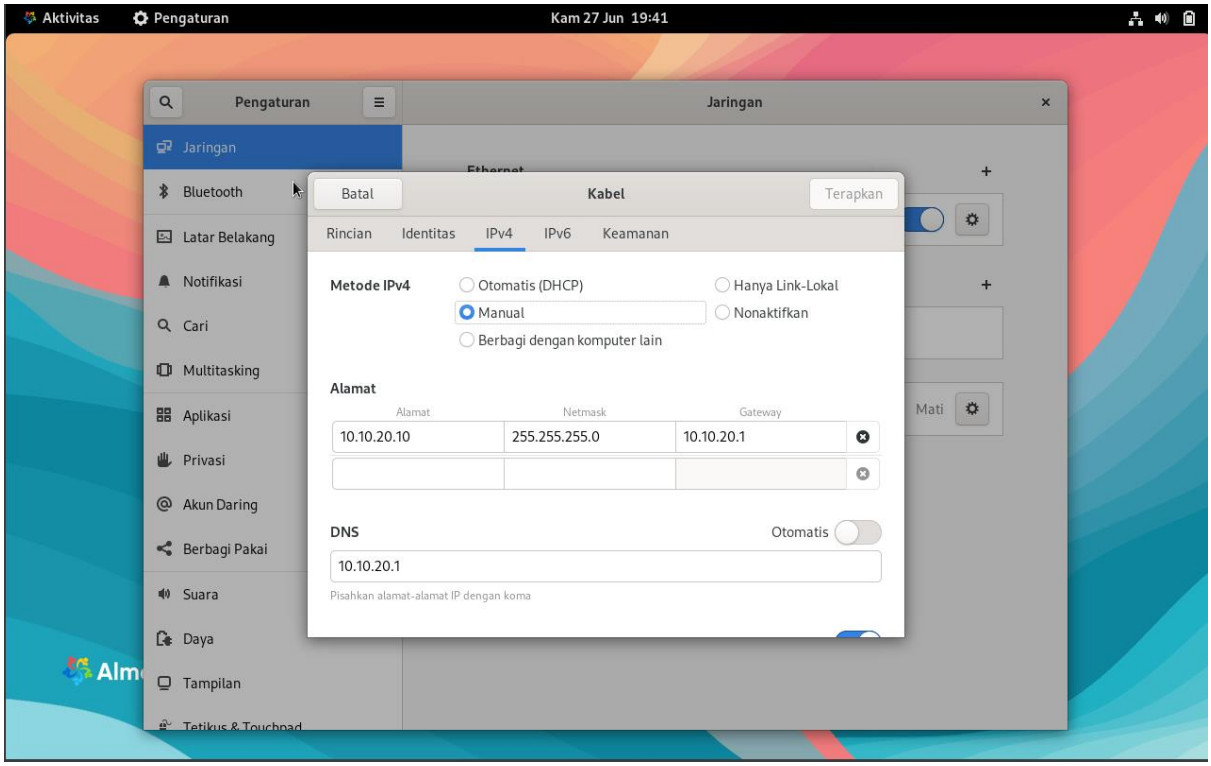


VIII. Konfigurasi VM management firewall dengan firewall internal

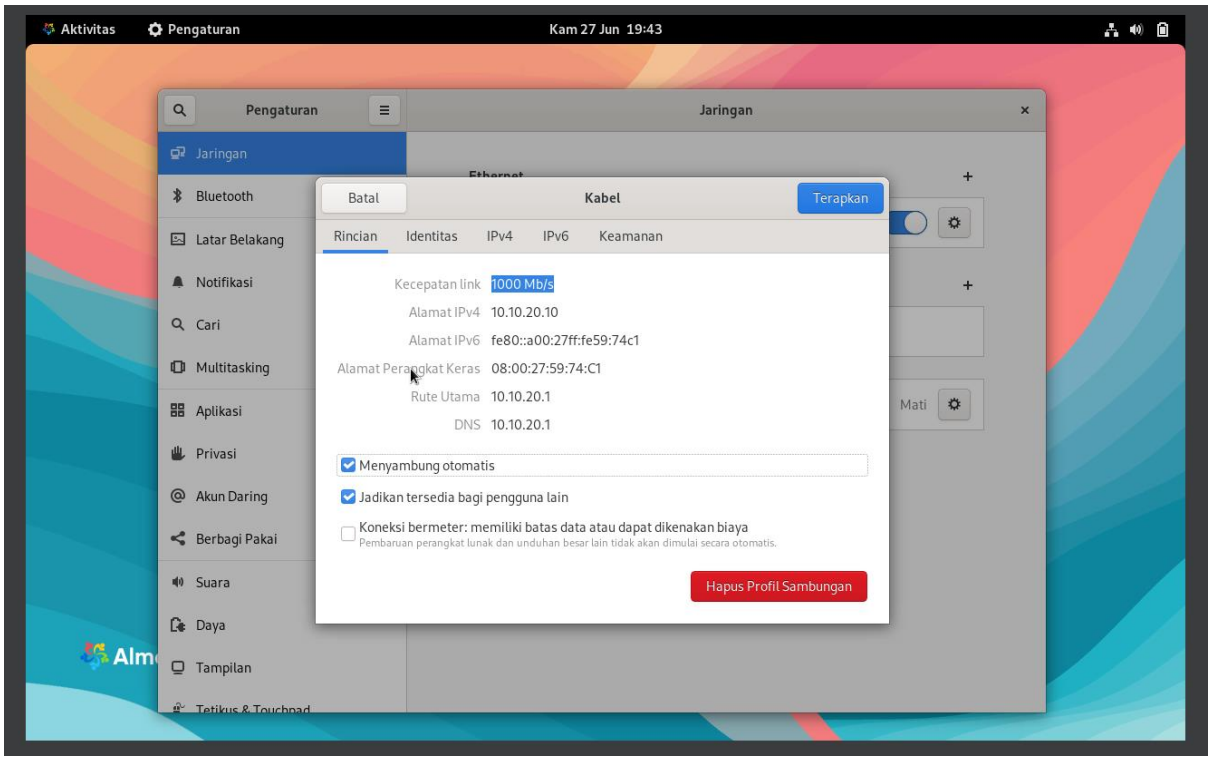
1. Masuk ke menu network



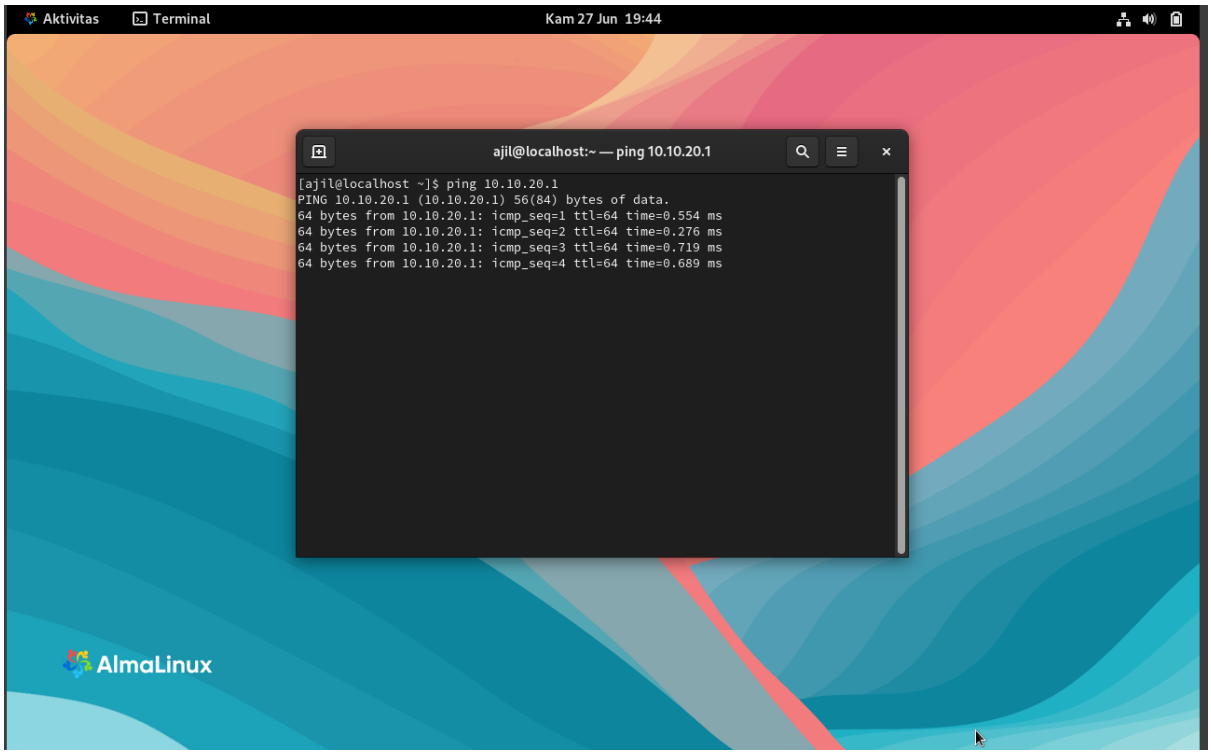
2. Klik setting pada ethernet dan pilihi ipv4 manual masukan ip address 10.10.20.10/24 lalu gateway 10.10.20.1 dan masukan dns 10.10.20.1 jika sudah klik terapkan dan restart



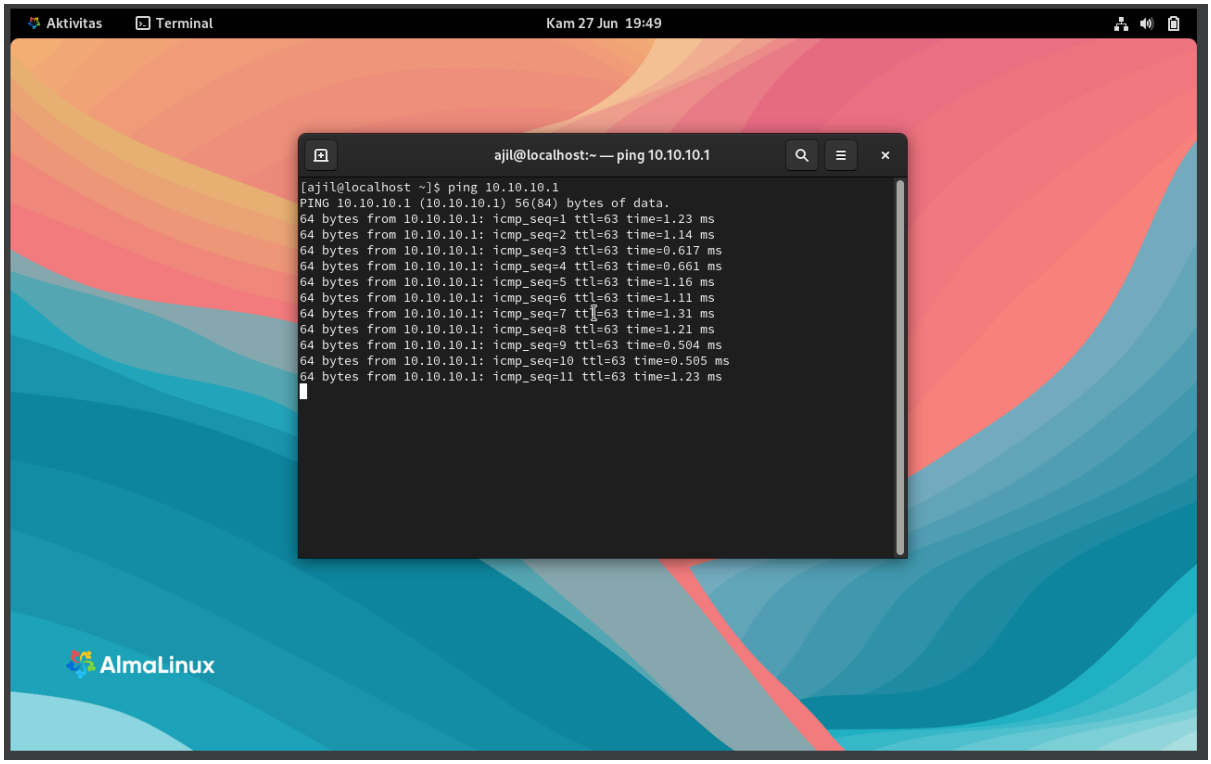
3. Jika sudah akan seperti gambar dibawah ini



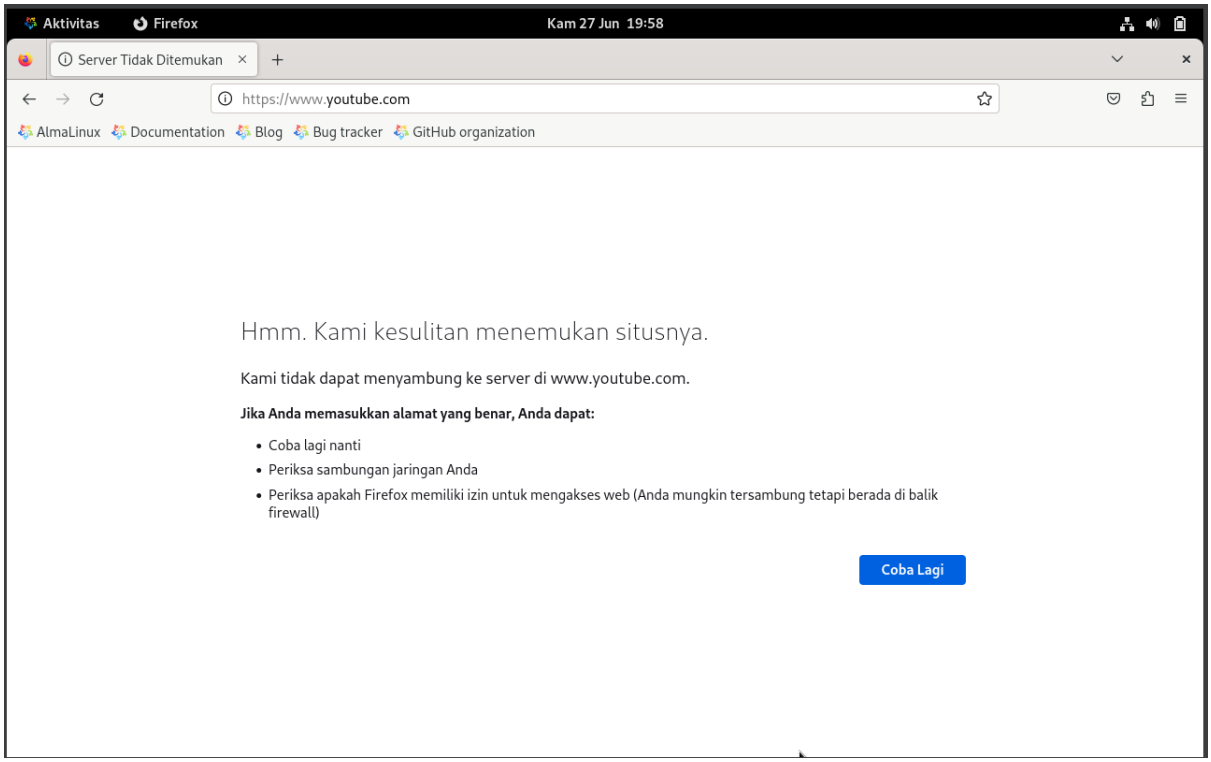
4. Uji konektifitas pada VM management firewall ke internal firewall



5. Uji konektifitas pada VM management firewall ke eksternal firewall

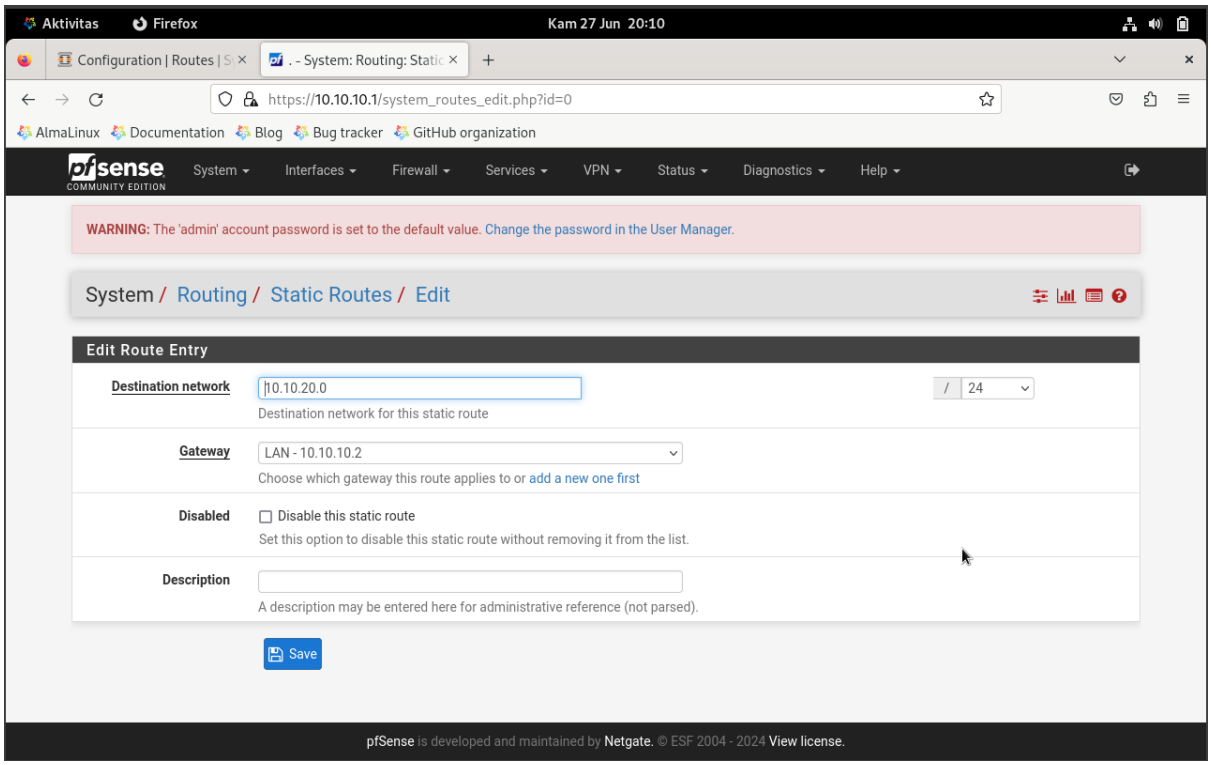


6. Uji vm management firewall terhubung ke internet, masih belum terhubung karena aturan default pada opnsense memblokir semua jaringan yang masuk, jadi perlu menambahkan rules baru.

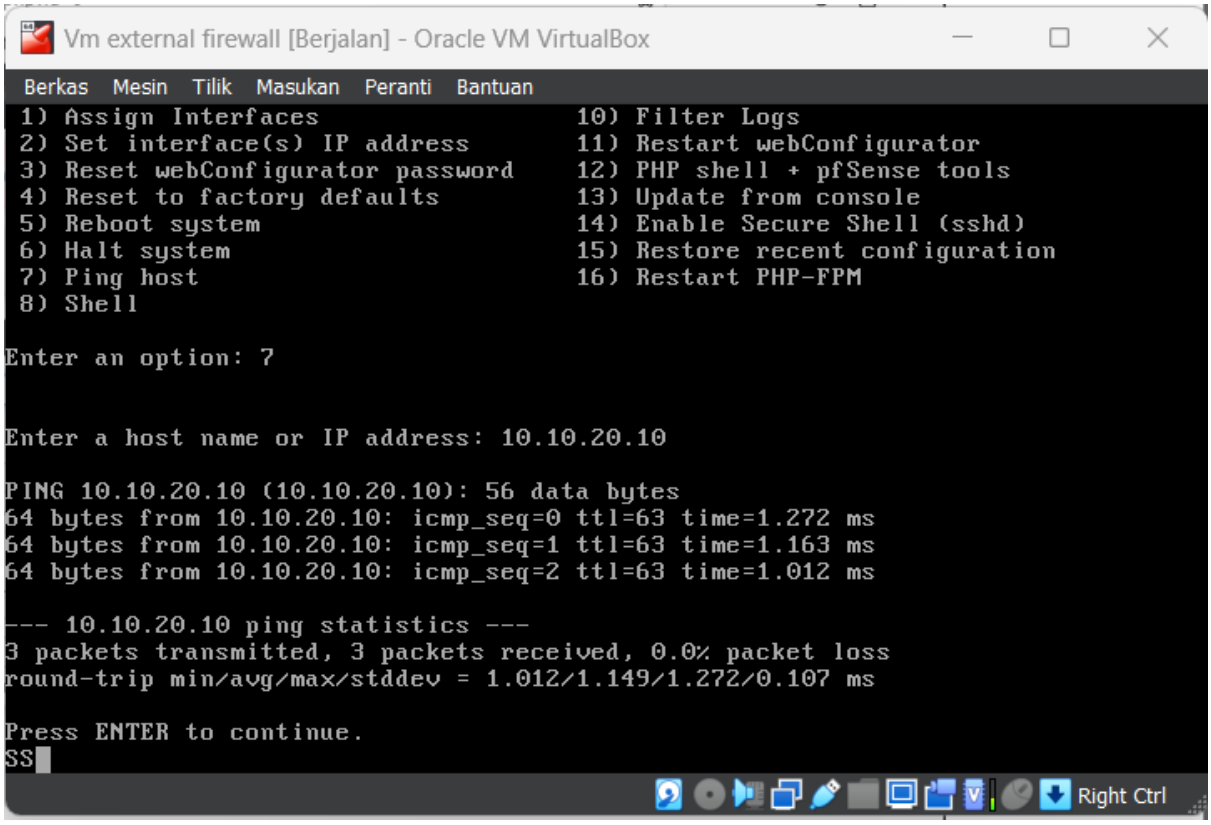


IX. Konfigurasi VM management firewall terhubung internet

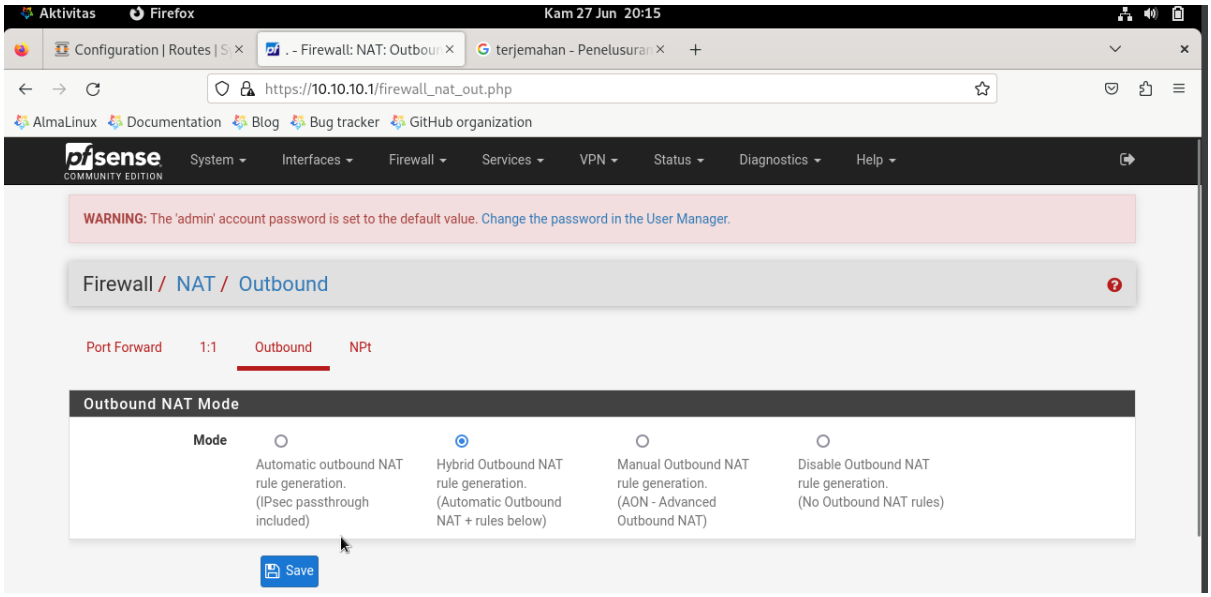
1. Masuk pada web gui pfsense lalu pada system->routing->static route->add , lalu isikan pada destination network pada subnet 10.10.20.0 dan gateway 10.10.10.2 lalu save



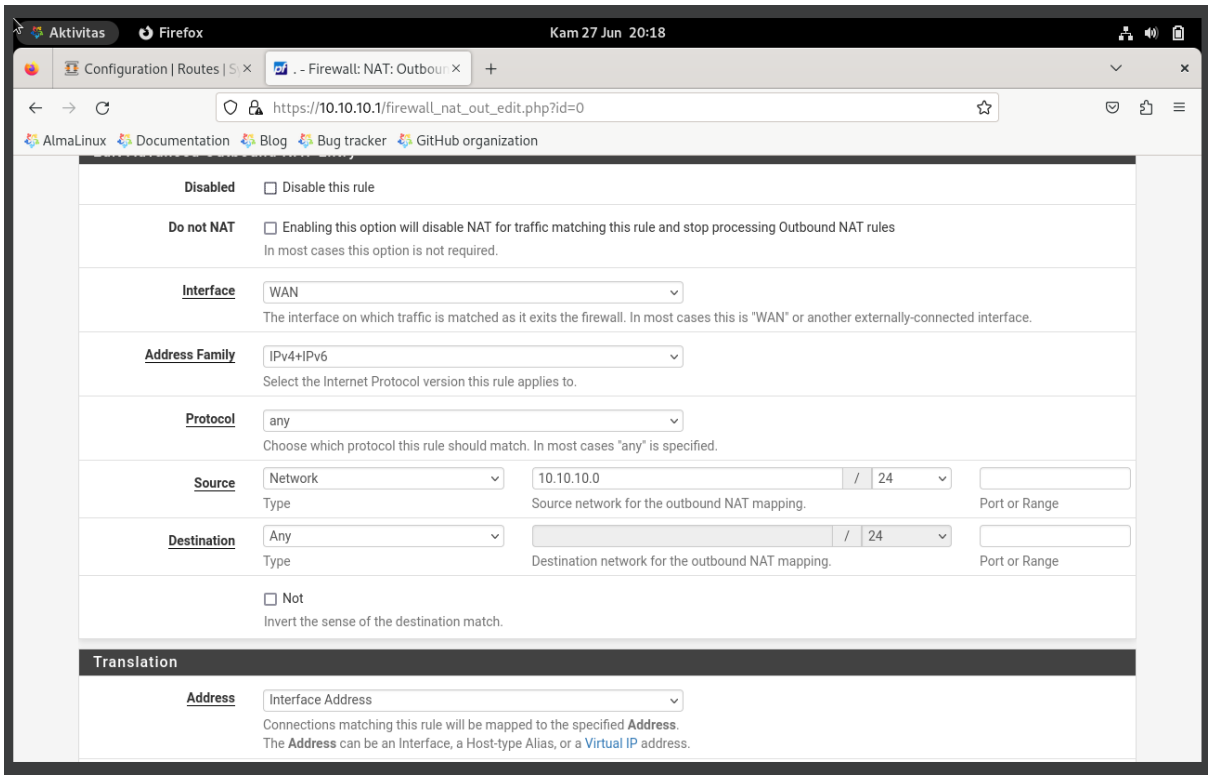
2. Uji konektifitas pada eksternal firewall ping ke vm management firewall



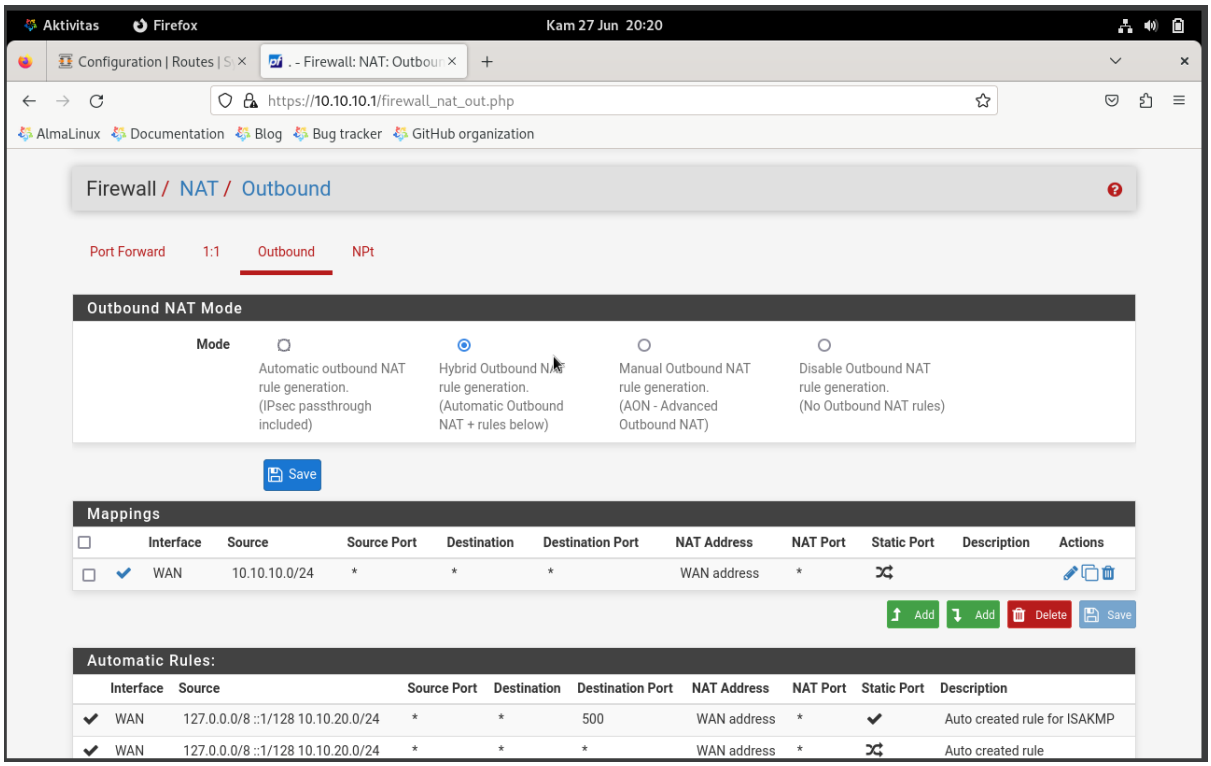
3. Masuk ke firewall->NAT->outbound dan pilih hybrid outbound nat rule generation klik save



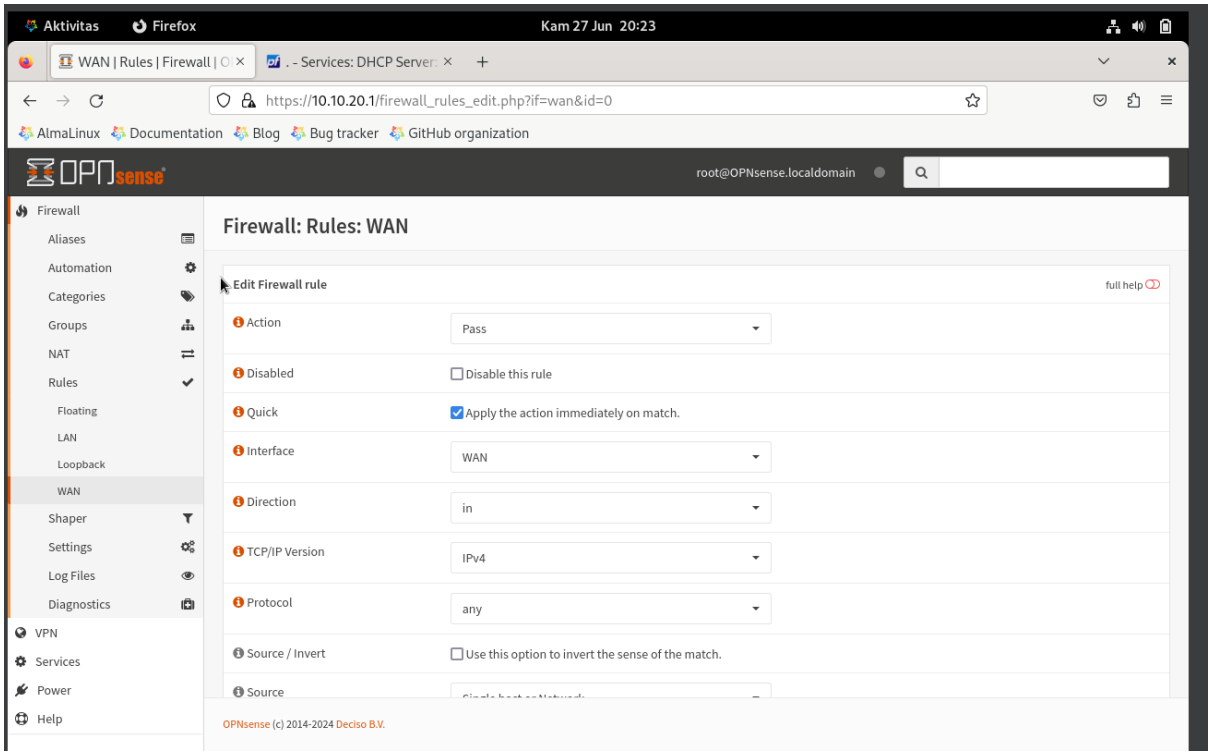
4. Lalu pada bagian mapping klik add masukan interface WAN, protocol any, source network 10.10.10.0/24, destination any, dan addres interface address lalu klik save

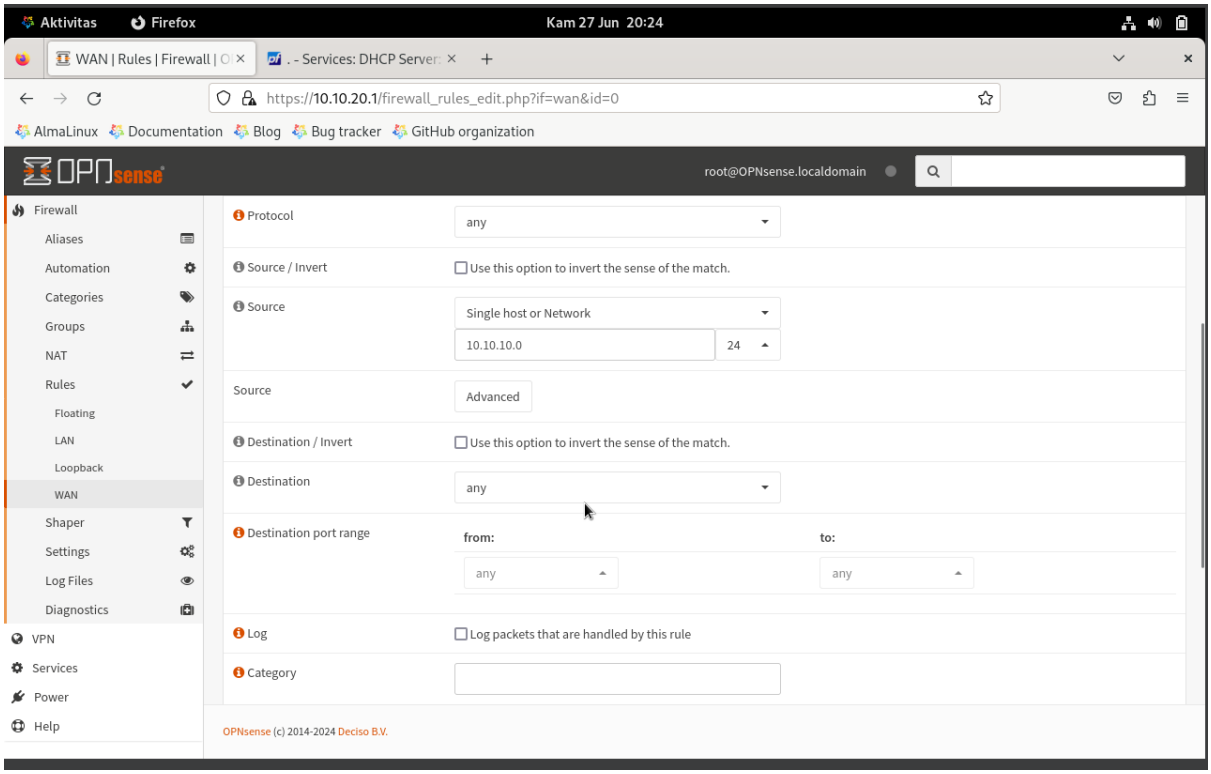


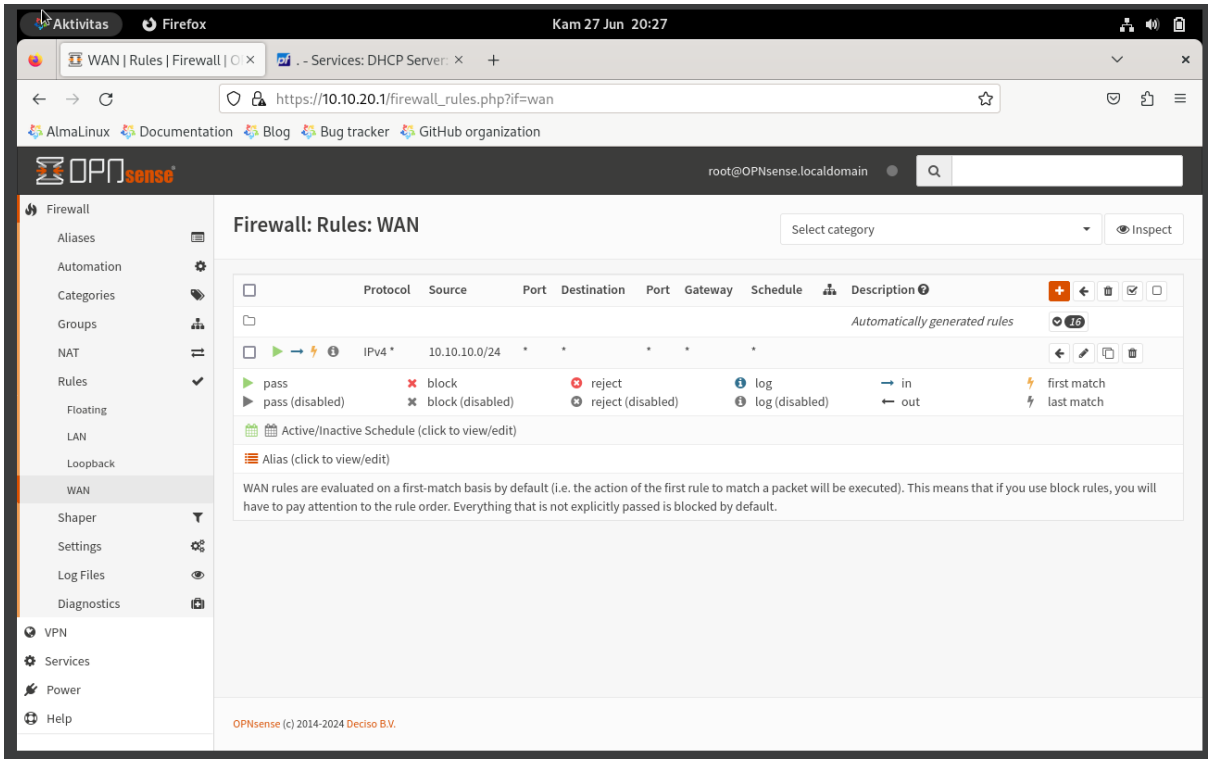
5. Hasil akan seperti gambar dibawah ini



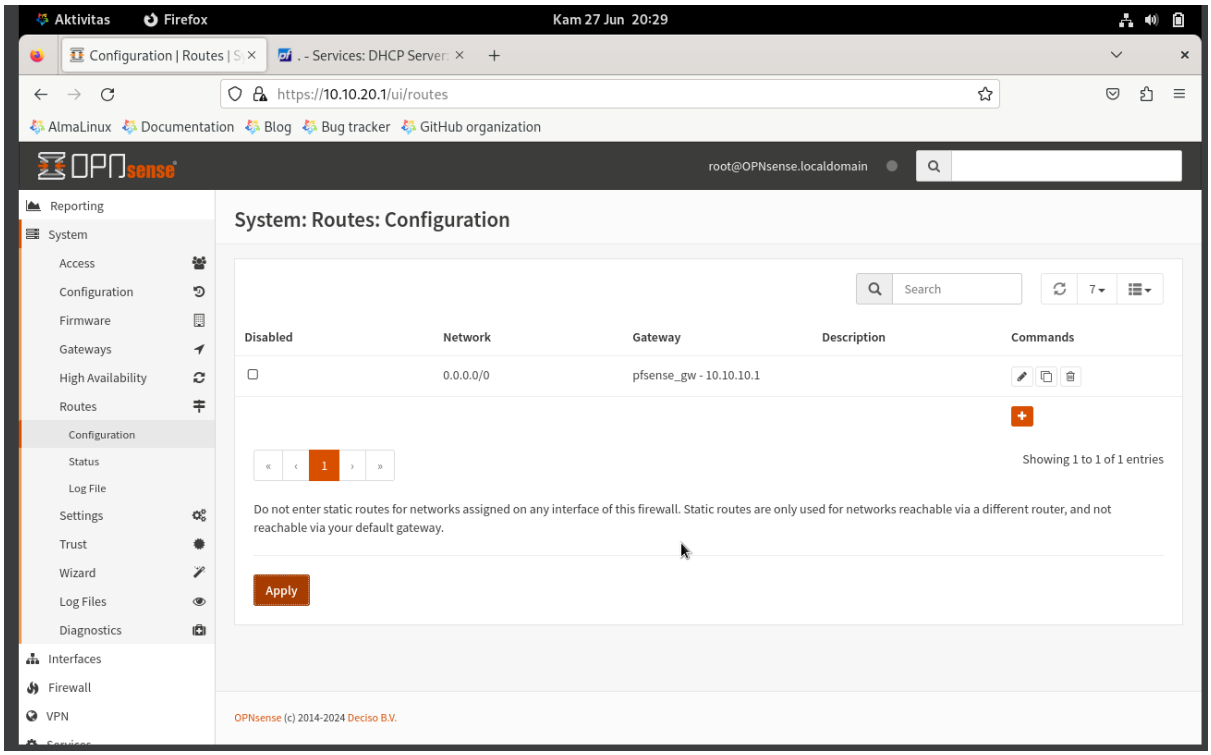
6. Selanjutnya masuk ke web gui internal firewall ke menu firewall->rules->wan lalu klik add pada bagian action pilih pass, interface wan, direction in, protocol any, source pilih single host or network lalu masukan network 10.10.10.0/24 , dan pada destination pilih any, lalu klik save



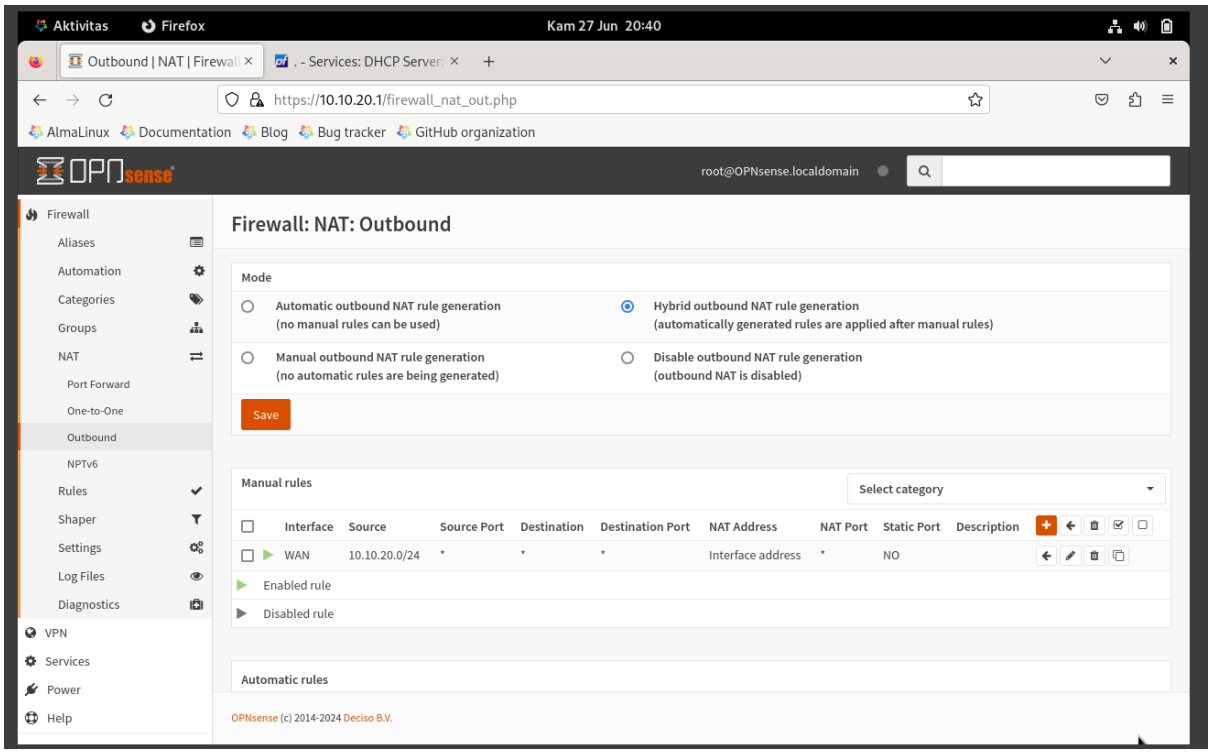

Aktivitas
Firefox
Kam 27 Jun 20:24
WAN | Rules | Firewall | O
. - Services: DHCP Server
https://10.10.20.1/firewall_rules_edit.php?if=wan&id=0
AlmaLinux
Documentation
Blog
Bug tracker
GitHub organization
OPNsense
root@OPNsense.localdomain
Firewall
Aliases
Automation
Categories
Groups
NAT
Rules
Floating
LAN
Loopback
WAN
Shaper
Settings
Log Files
Diagnostics
VPN
Services
Power
Help
Protocol
any
Source / Invert
Use this option to invert the sense of the match.
Source
Single host or Network
10.10.10.0
24
Source
Advanced
Destination / Invert
Use this option to invert the sense of the match.
Destination
any
Destination port range
from:
to:
any
any
Log
Log packets that are handled by this rule
Category
OPNsense (c) 2014-2024 Deciso B.V.

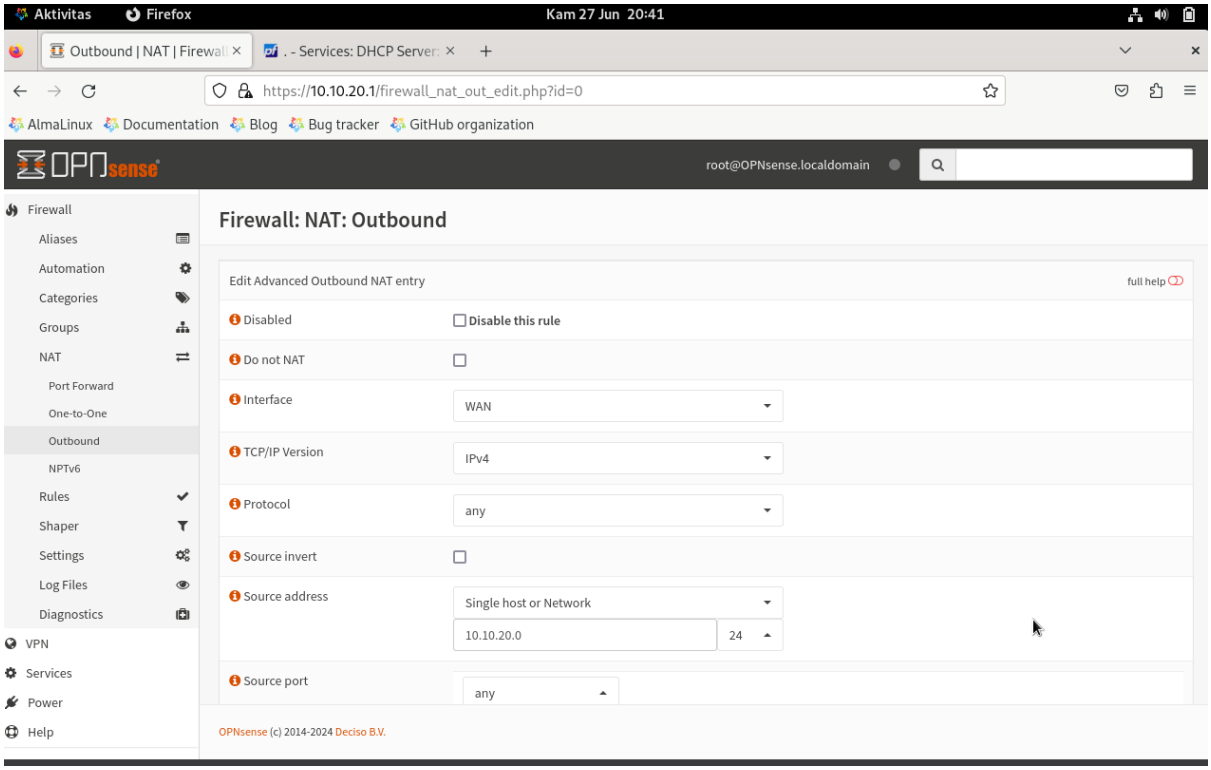

Aktivitas
Firefox
Kam 27 Jun 20:27
WAN | Rules | Firewall | O
. - Services: DHCP Server
https://10.10.20.1/firewall_rules.php?if=wan
AlmaLinux
Documentation
Blog
Bug tracker
GitHub organization
OPNsense
root@OPNsense.localdomain
Firewall
Aliases
Automation
Categories
Groups
NAT
Rules
Floating
LAN
Loopback
WAN
Shaper
Settings
Log Files
Diagnostics
VPN
Services
Power
Help
Firewall: Rules: WAN
Select category
Inspect
Protocol
Source
Port
Destination
Port
Gateway
Schedule
Description
Automatically generated rules
16
IPv4 *
10.10.10.0/24
pass
pass (disabled)
block
block (disabled)
reject
reject (disabled)
log
log (disabled)
in
out
first match
last match
Active/Inactive Schedule (click to view/edit)
Alias (click to view/edit)
WAN rules are evaluated on a first-match basis by default (i.e. the action of the first rule to match a packet will be executed). This means that if you use block rules, you will have to pay attention to the rule order. Everything that is not explicitly passed is blocked by default.
OPNsense (c) 2014-2024 Deciso B.V.

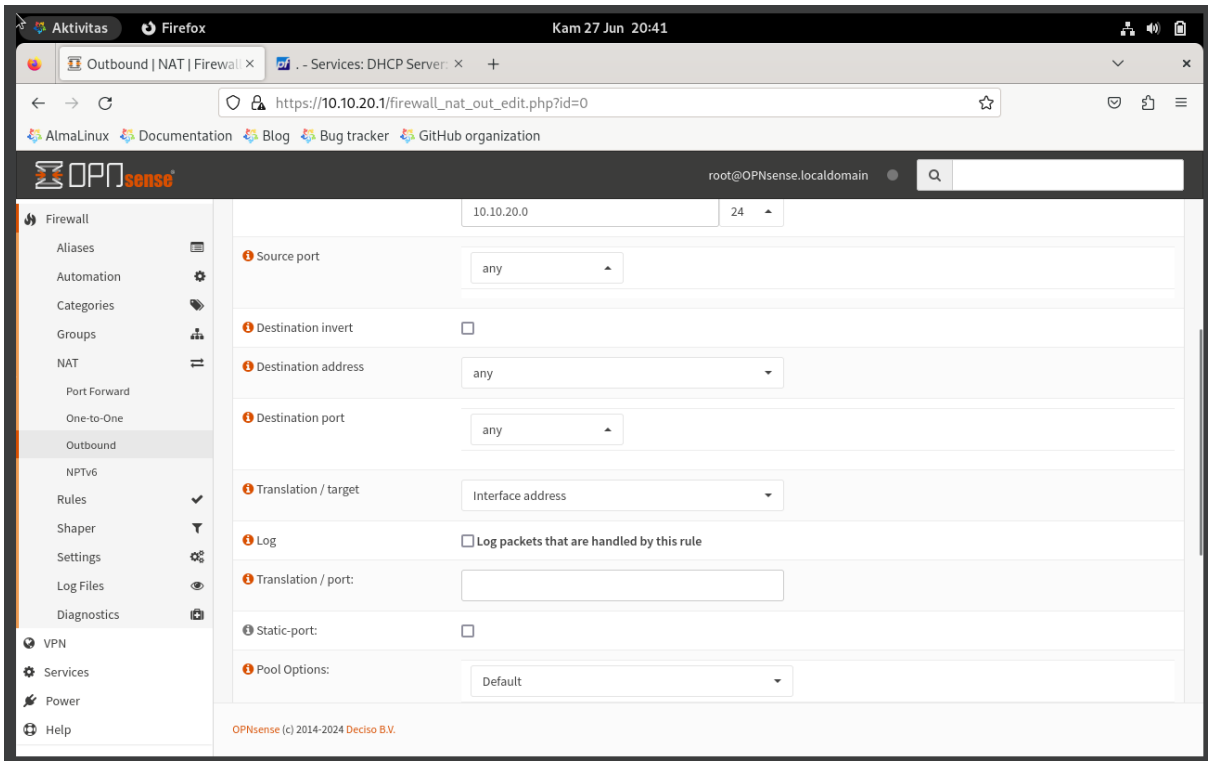
7. Setting routing pada internal firewall klik add masukan network 0.0.0.0/0 dan gateway 10.10.10.1



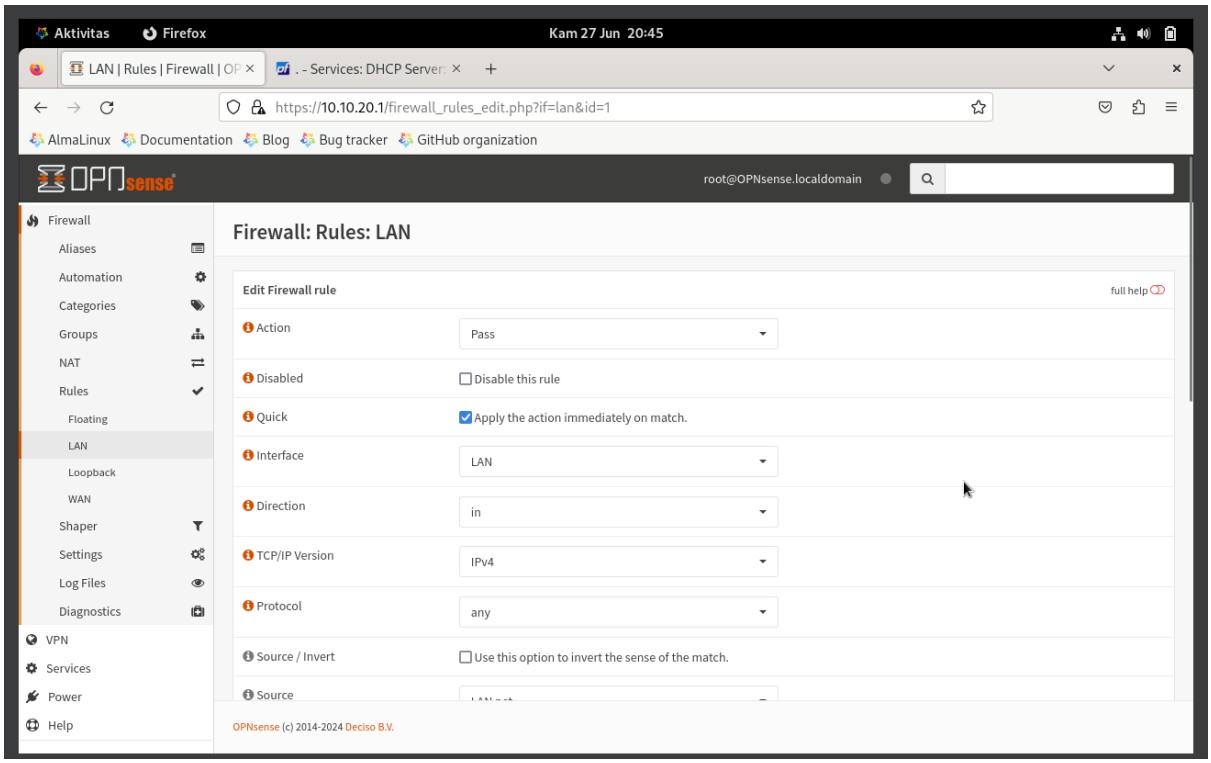
8. Lalu konfigurasi pada outbound pilih mode hybrid, lalu add rules interface wan lalu konfigurasi seperti gambar dibawah ini lalu klik save

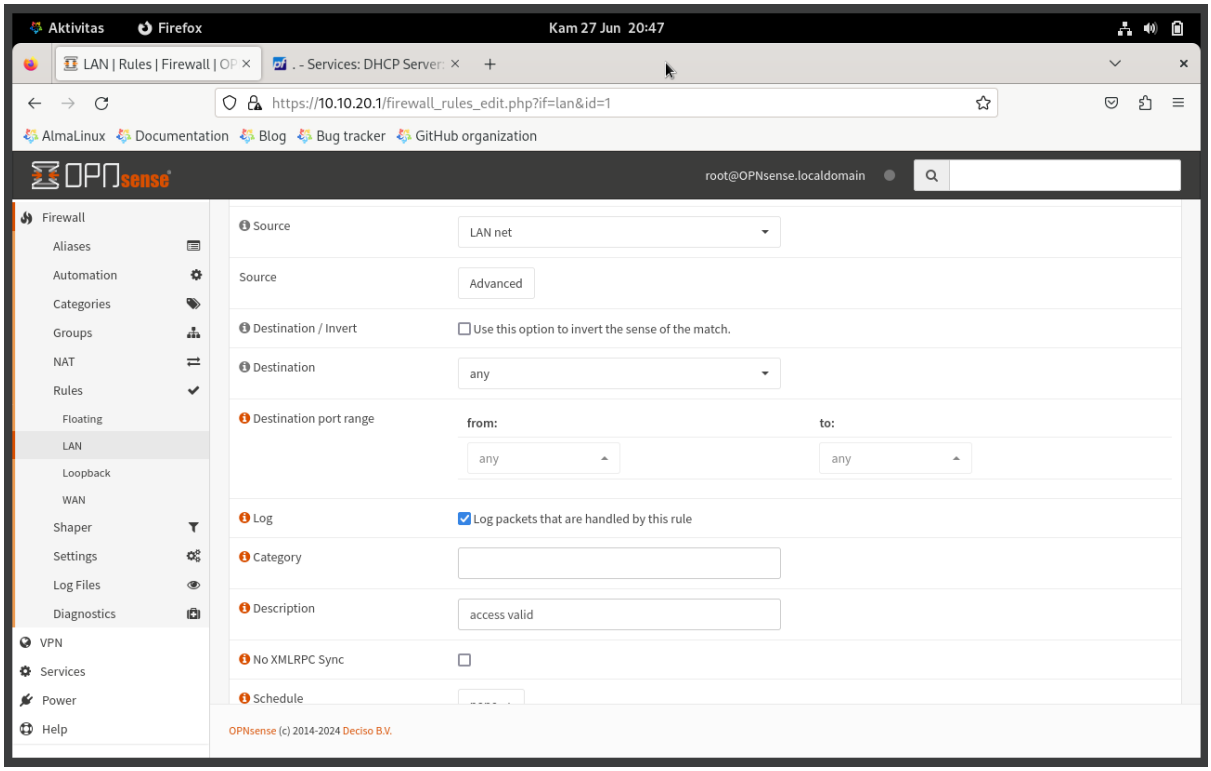


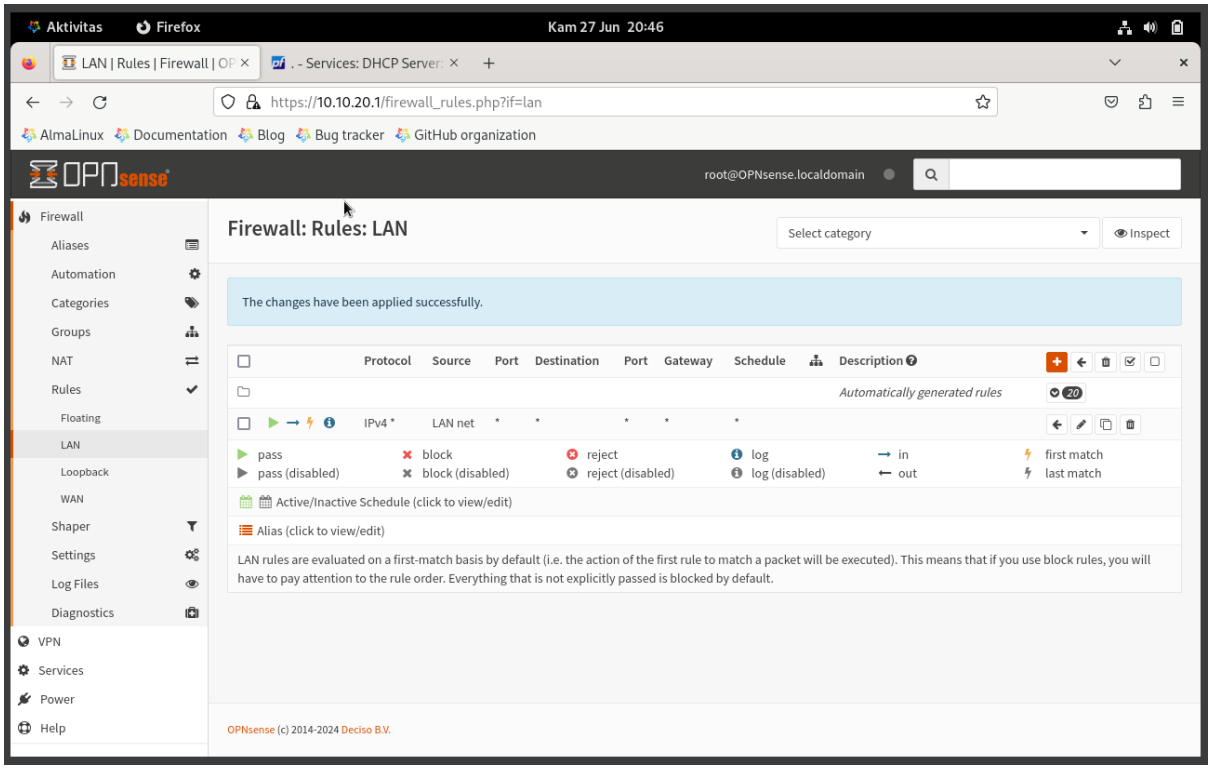

Aktivitas
Firefox
Kam 27 Jun 20:41
Outbound | NAT | Firewall
. - Services: DHCP Server
https://10.10.20.1/firewall_nat_out_edit.php?id=0
AlmaLinux
Documentation
Blog
Bug tracker
GitHub organization
root@OPNsense.localdomain
Firewall
Aliases
Automation
Categories
Groups
NAT
Port Forward
One-to-One
Outbound
NPTv6
Rules
Shaper
Settings
Log Files
Diagnostics
VPN
Services
Power
Help
Firewall: NAT: Outbound
Edit Advanced Outbound NAT entry
full help
Disabled
Disable this rule
Do not NAT
Interface
WAN
TCP/IP Version
IPv4
Protocol
any
Source invert
Source address
Single host or Network
10.10.20.0
24
Source port
any
OPNsense (c) 2014-2024 Deciso B.V.


Aktivitas
Firefox
Kam 27 Jun 20:41
Outbound | NAT | Firewall
. - Services: DHCP Server
https://10.10.20.1/firewall_nat_out_edit.php?id=0
AlmaLinux
Documentation
Blog
Bug tracker
GitHub organization
root@OPNsense.localdomain
10.10.20.0
24
Source port
any
Destination invert
Destination address
any
Destination port
any
Translation / target
Interface address
Log
Log packets that are handled by this rule
Translation / port:
Static-port:
Pool Options:
Default
OPNsense (c) 2014-2024 Deciso B.V.

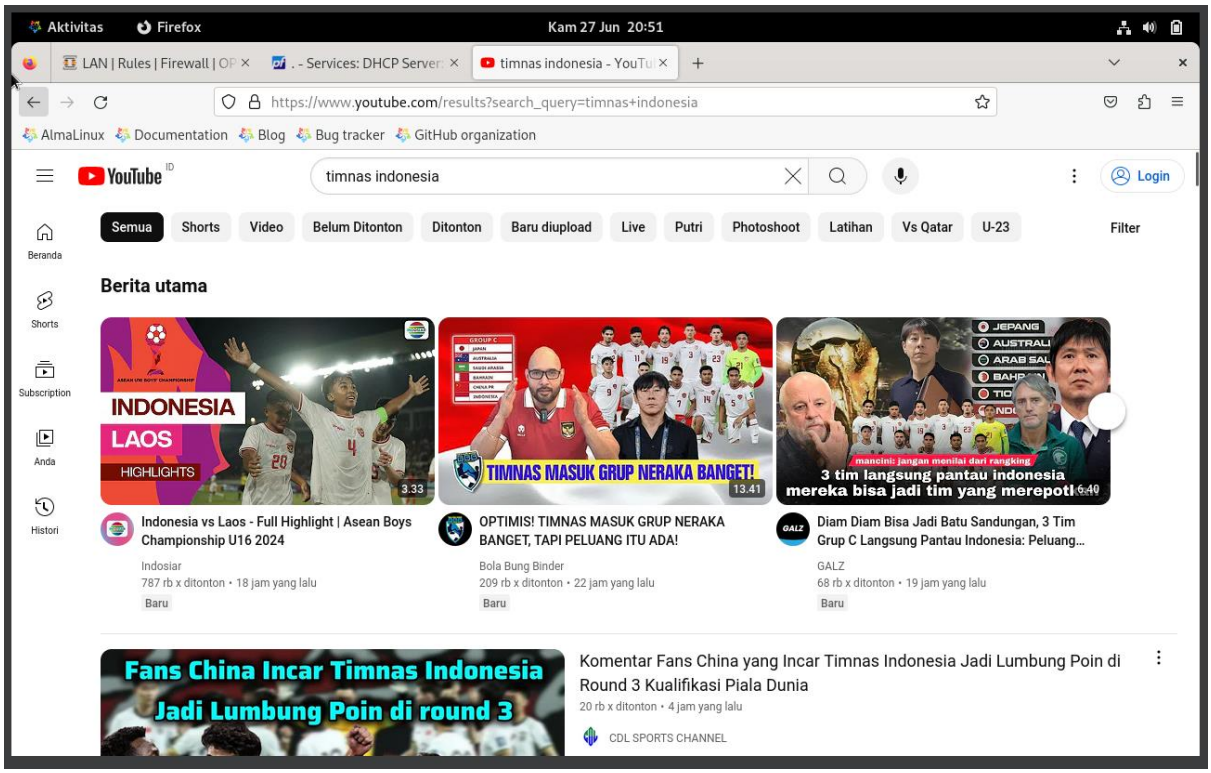
9. Lalu pada menu firewall tambahkan aturan baru pada LAN seperti gambar dibawah ini dengan action pass dimana semua alamat dari semua lan network ke semua destination di bolehkan.



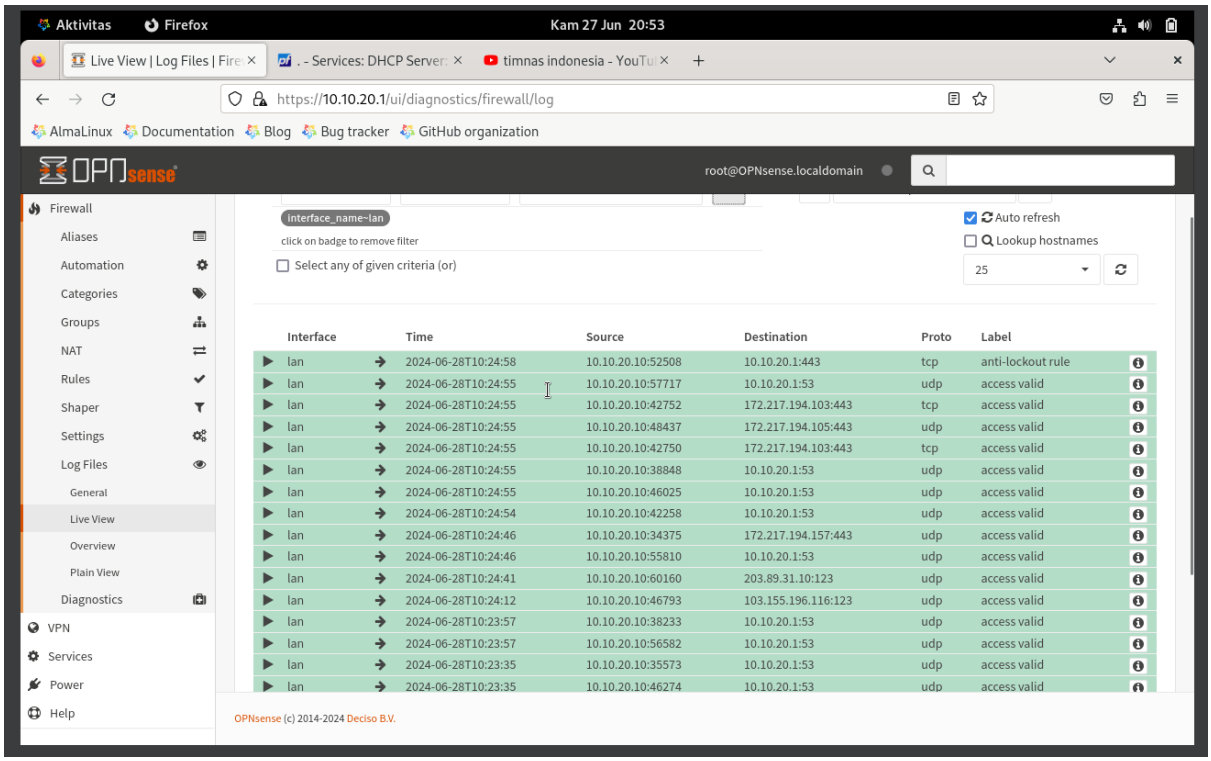




10. Cek konektifitas vm management firewall dengan internet dan terhubung

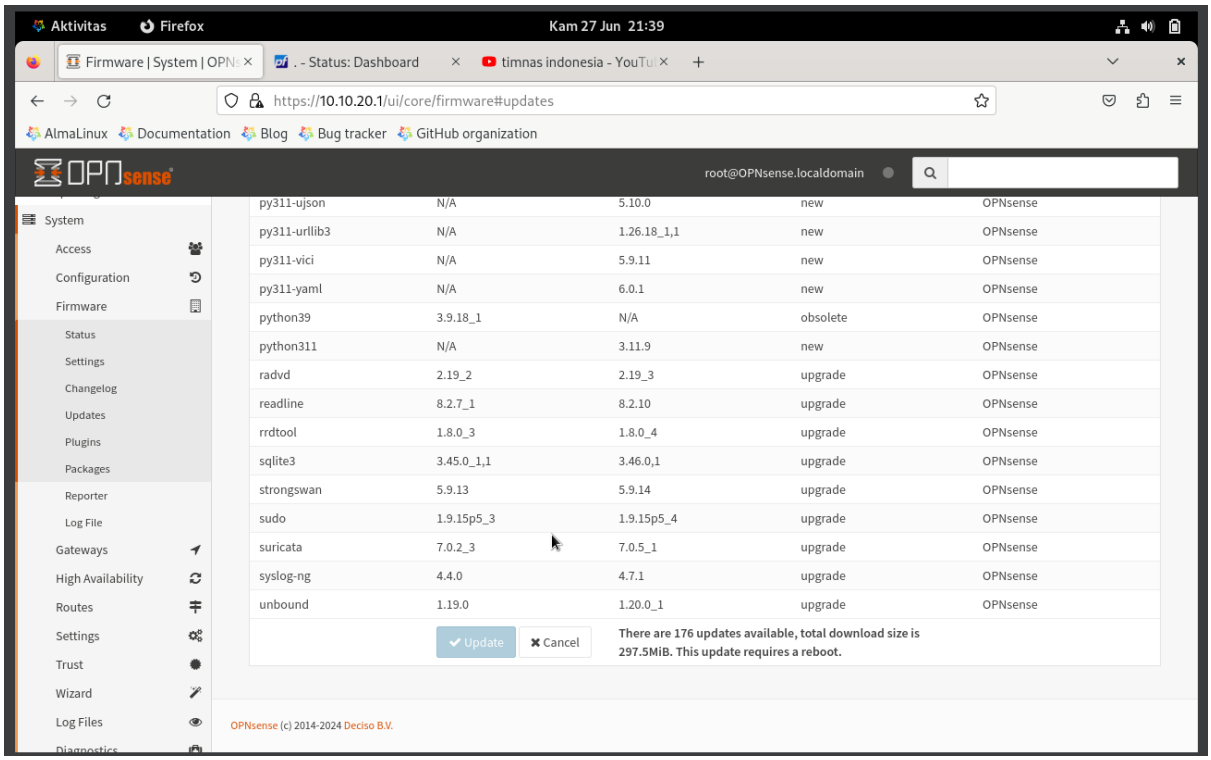


11. Cek pada log files pada lan dan berhasil.

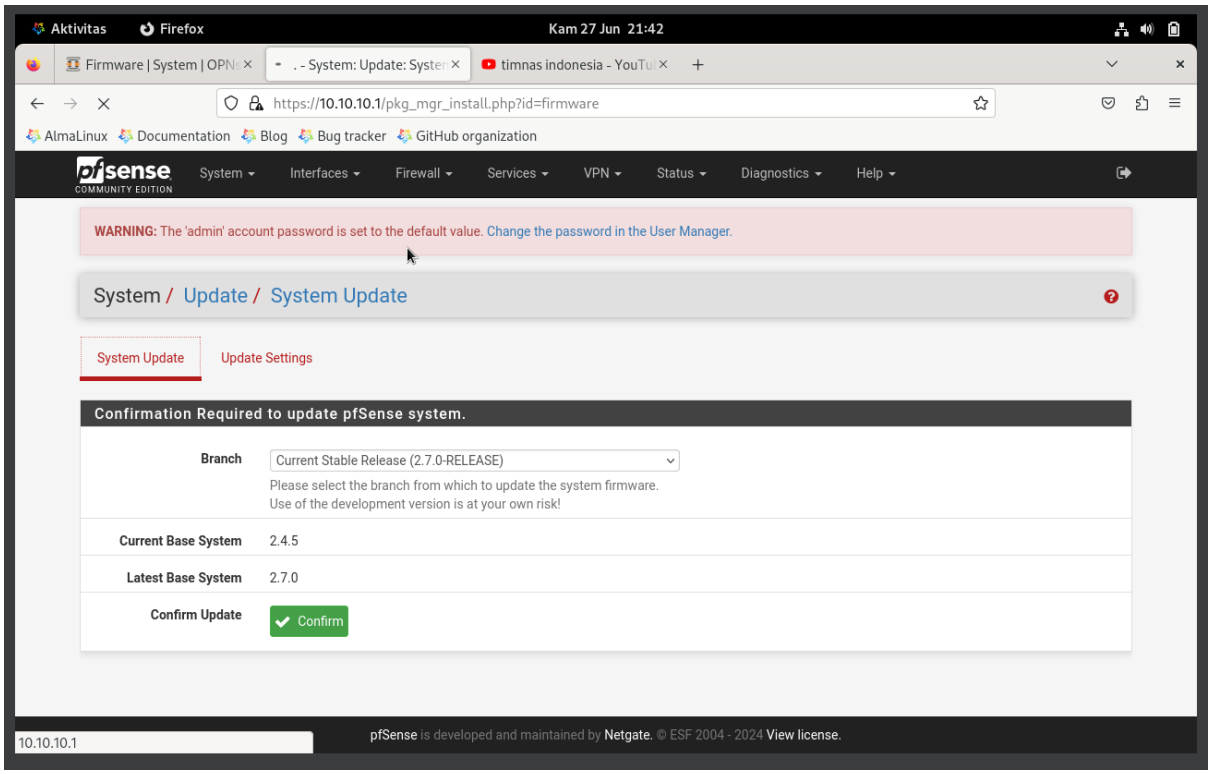


X. Update seluruh VM

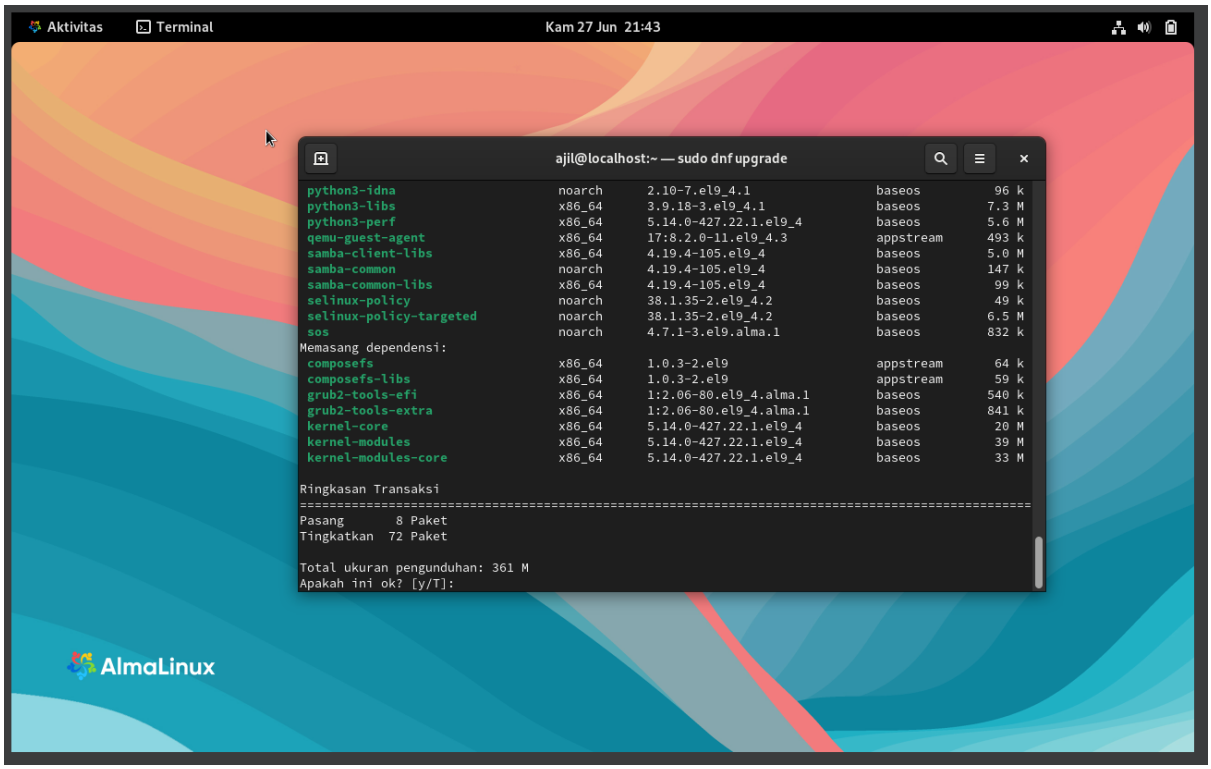
1. Update opnsense internal firewall



2. Update pfsense internal firewall

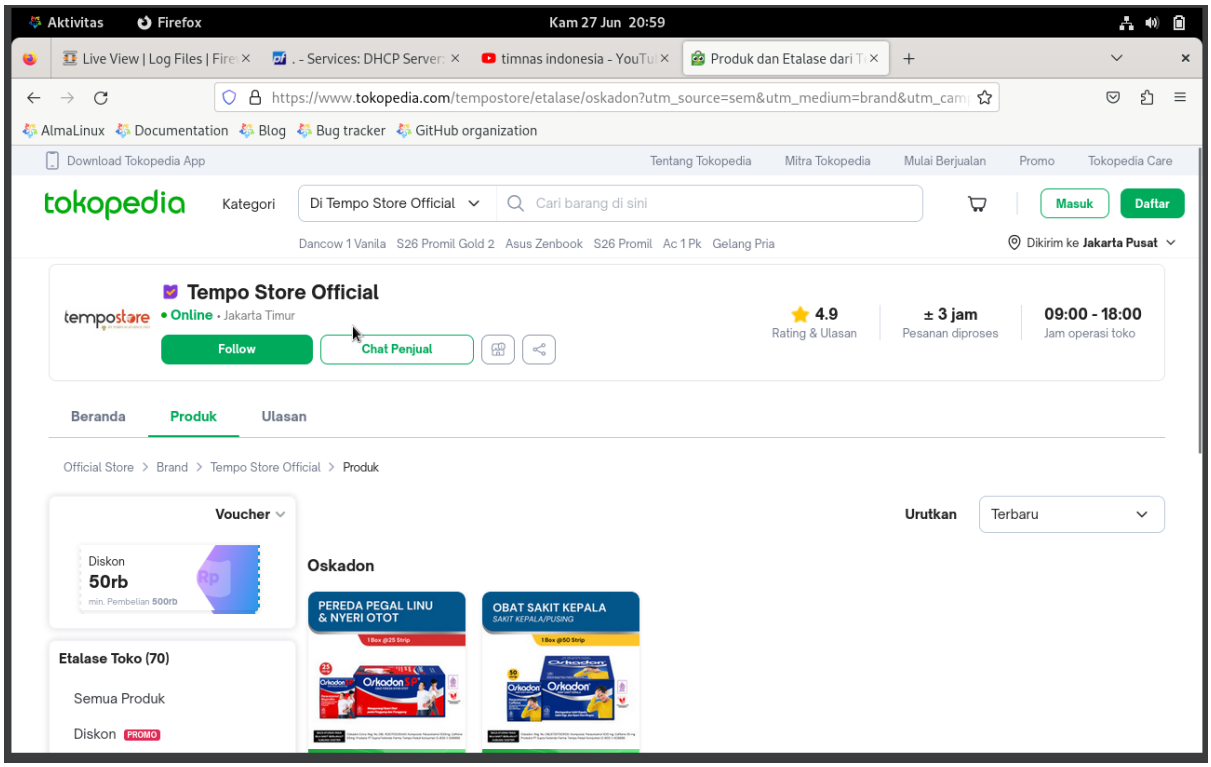


3. Update vm management firewall alma linux

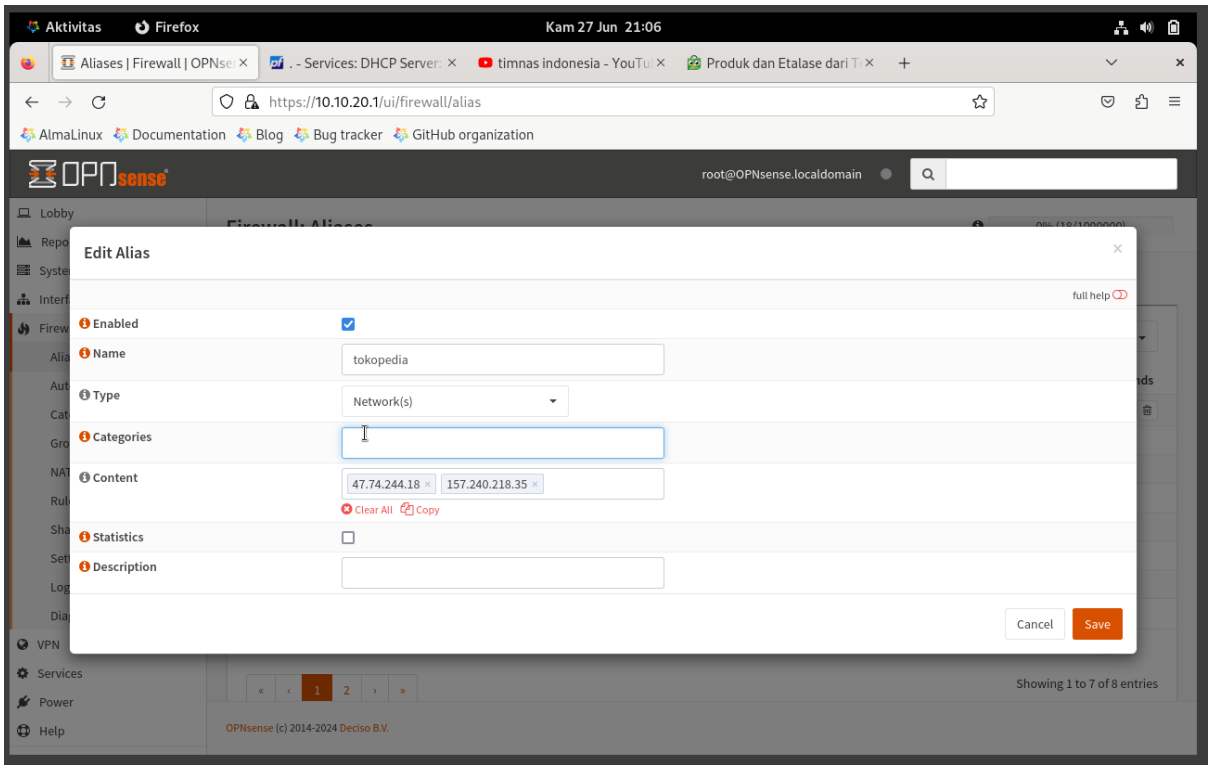


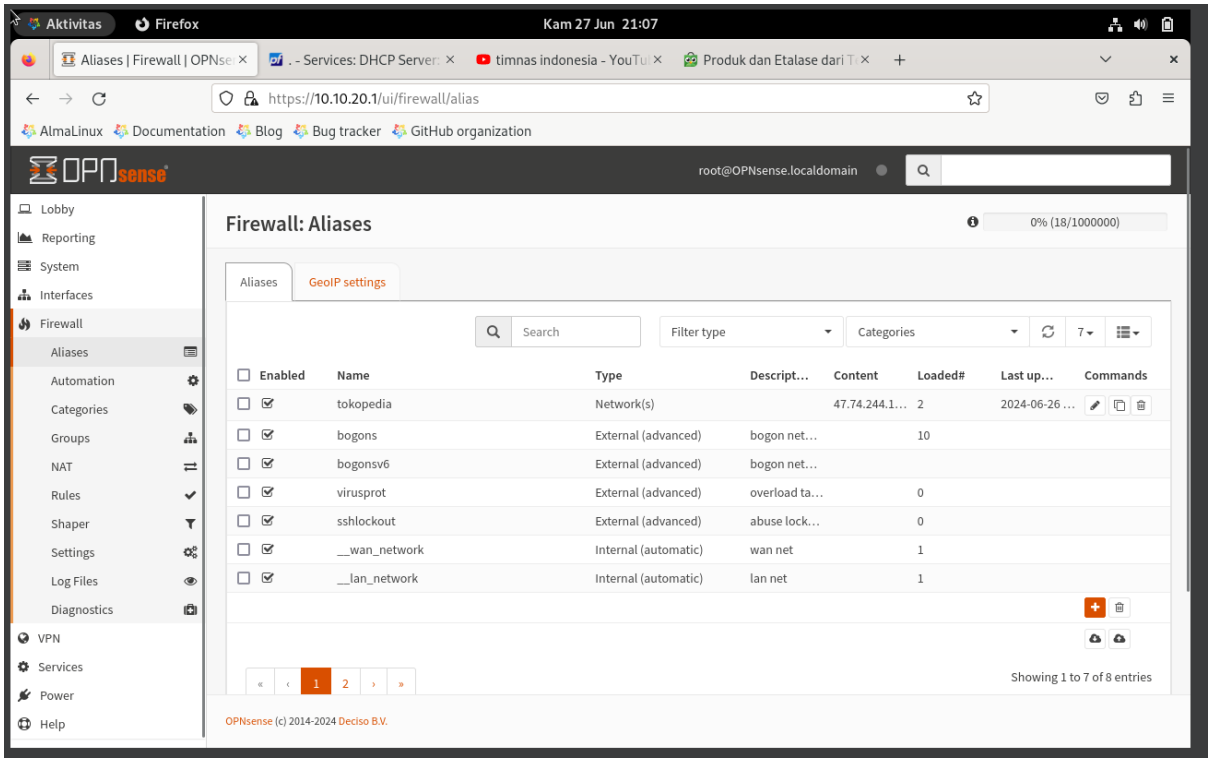
XI. Membuat contoh rule baru yang di set pada internal firewall

1. Disini mencoba untuk menambahkan rule baru untuk akses sites contoh menggunakan tokopedia pada halaaman ini masih bisa kita akses untuk memblokir akses tersebut kita menambahkan rule baru

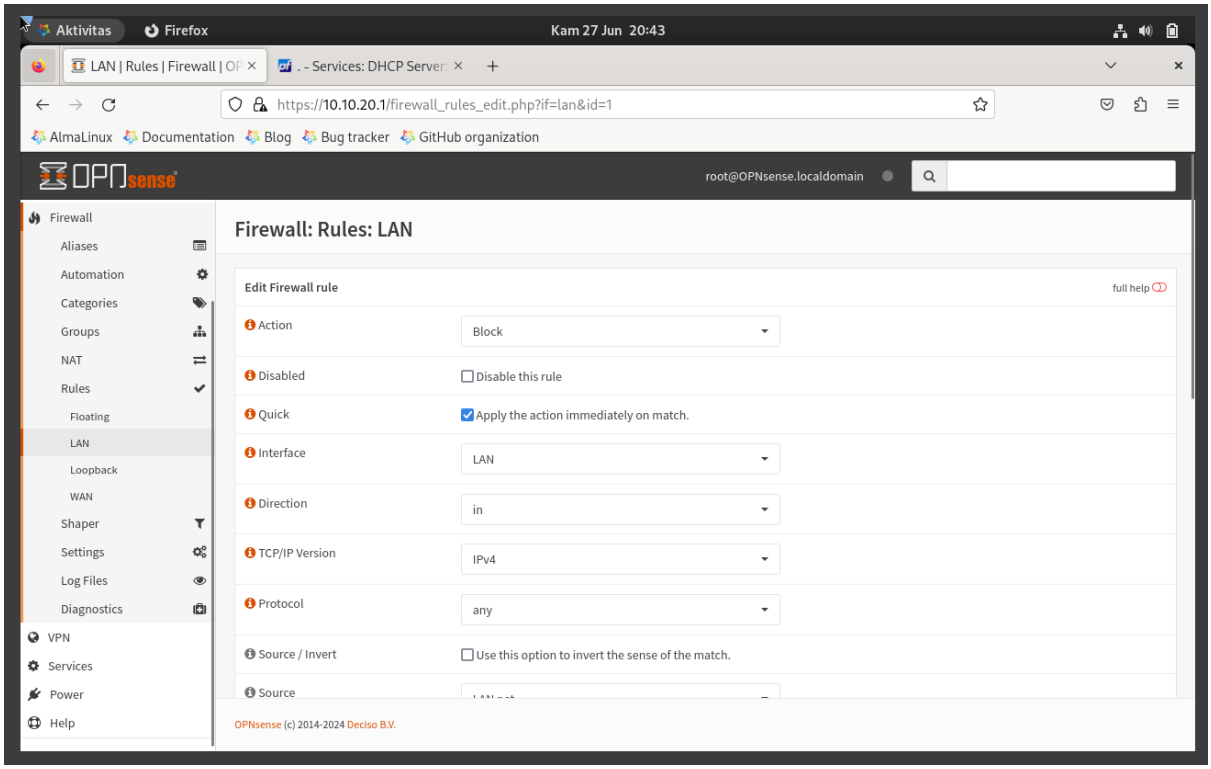


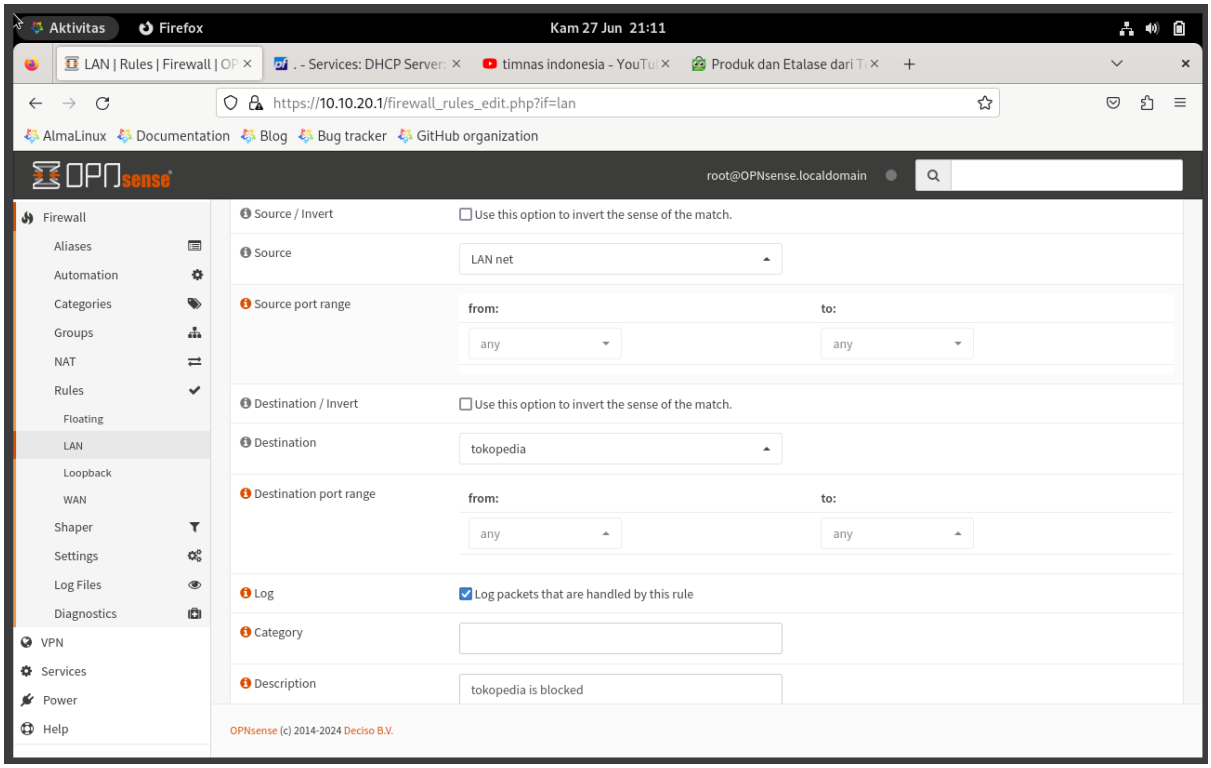
2. Pada menu firewall->aliases lalu klik add dan masukan type network dengan content berisi addreess tokopedia lalu klik save



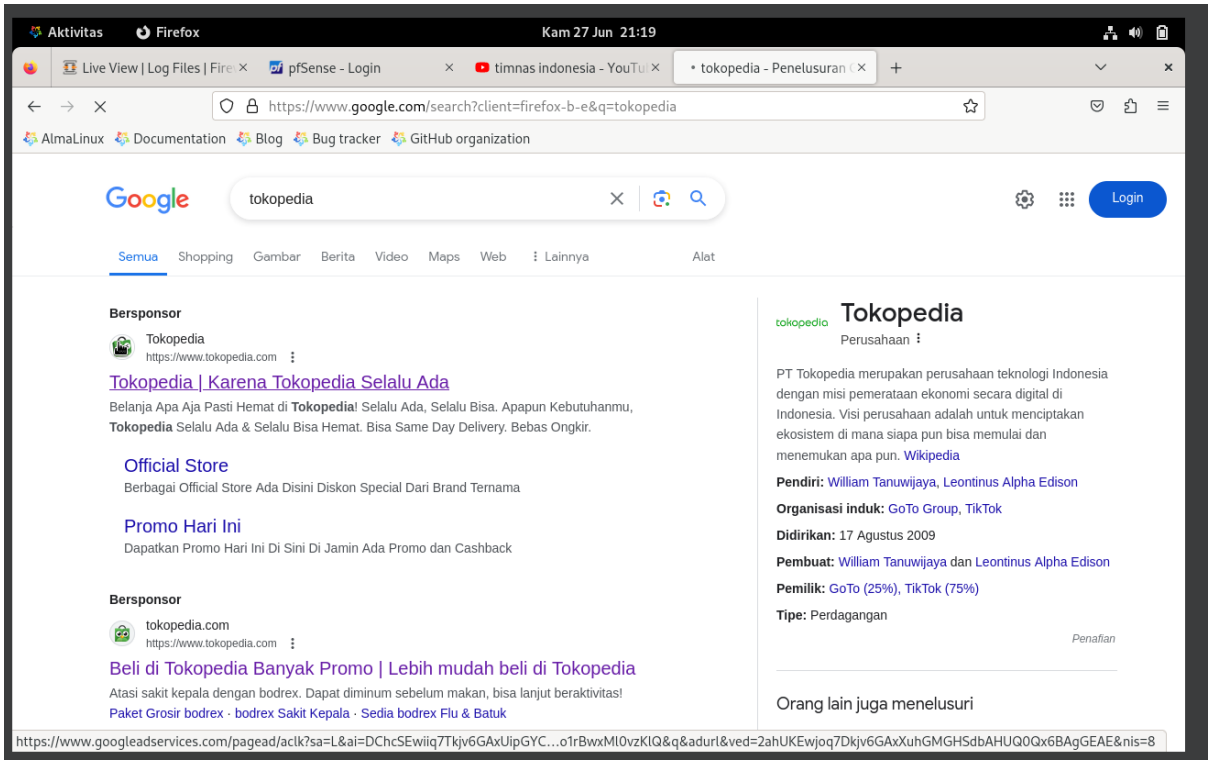


3. Lalu masuk pada rules->lan lalu klik add tambahkan rules seperti gambar dibawah ini, lalu klik save

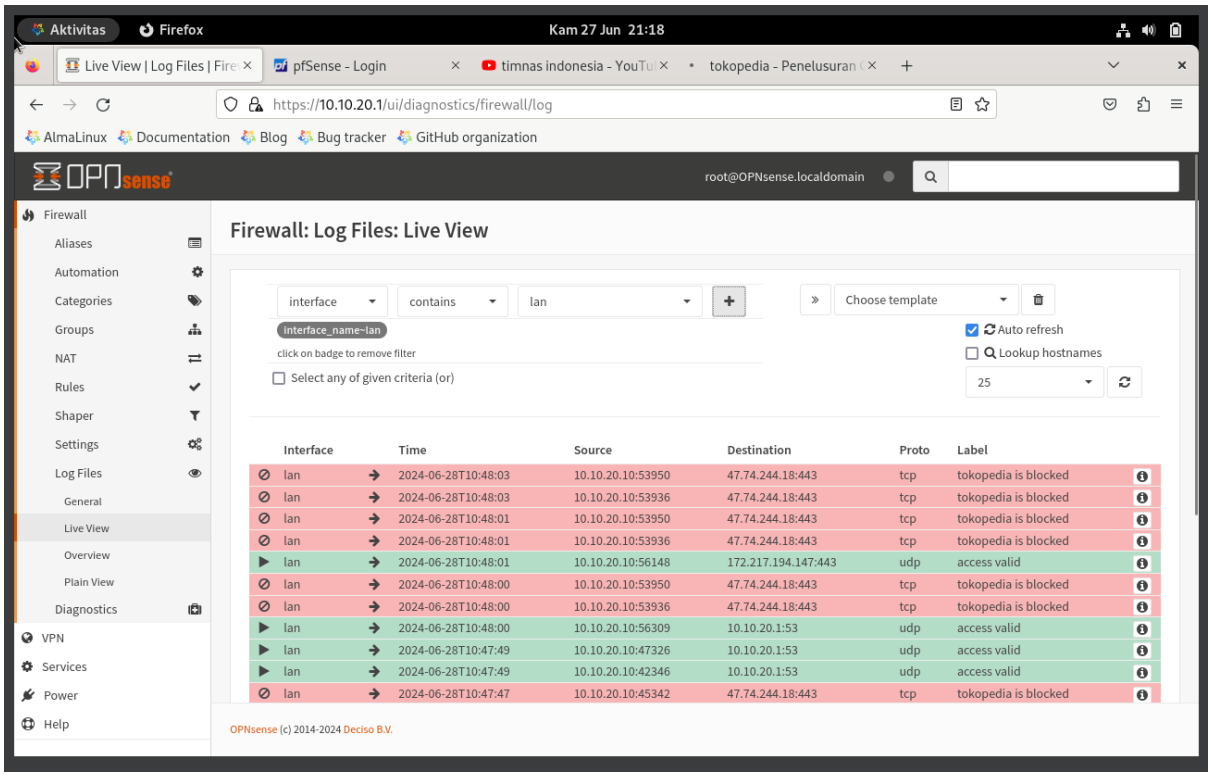




4. Mencoba ulang akses masuk ke halaman tokopedia tidak berhasil



5. Tampilan log ketika akses tokopedia



XII. Kesimpulan

Menggunakan kombinasi dua firewall, yaitu pfSense dan OPNsense, dengan konfigurasi seperti yang dijelaskan, menawarkan lapisan perlindungan dan pengaturan jaringan yang lebih tersegmentasi dan aman. Di pfSense, jaringan diatur untuk menghubungkan jaringan internal ke internet dengan NAT dan berfungsi sebagai firewall utama yang mengelola lalu lintas dari dan ke internet. OPNsense, ditempatkan sebagai firewall tambahan antara pfSense dan VM Management Firewall di jaringan 10.10.10.0/24 dan 10.10.20.0/24, memperketat kontrol akses internal dengan aturan spesifik seperti memblokir akses ke situs tertentu seperti Tokopedia. Dengan cara ini, OPNsense memberikan kontrol granular pada lalu lintas internal dan memastikan kebijakan keamanan yang lebih ketat untuk lalu lintas antar-segmen, sedangkan pfSense mengelola akses dan konektivitas yang lebih luas ke dan dari internet. Kombinasi ini memungkinkan pemisahan tanggung jawab antara konektivitas umum dan keamanan spesifik, meningkatkan fleksibilitas, manajemen, dan keamanan jaringan keseluruhan.

Daftar pustaka

OPNsense® a true open source security platform and more - OPNsense® is a true open source firewall and more

pfSense CE RELEASE amd64 : pfSense : Free Download, Borrow, and Streaming : Internet Archive

AlmaLinux OS - Forever-Free Enterprise-Grade Operating System

ChatGPT

https://youtu.be/NE5xzb-qJgA?si=tuZBhVKk1ki8FsKr

https://youtu.be/CcXYiFj9mBA?si=Ya6v1mtO1dD_Z7YT

https://youtu.be/o12a2cFGopQ?si=HqQzZI0fTeiYI2KF

Certified Network Defender (CND) Version 2 w/ iLabs (Volumes 1 through 4), 2nd Edition