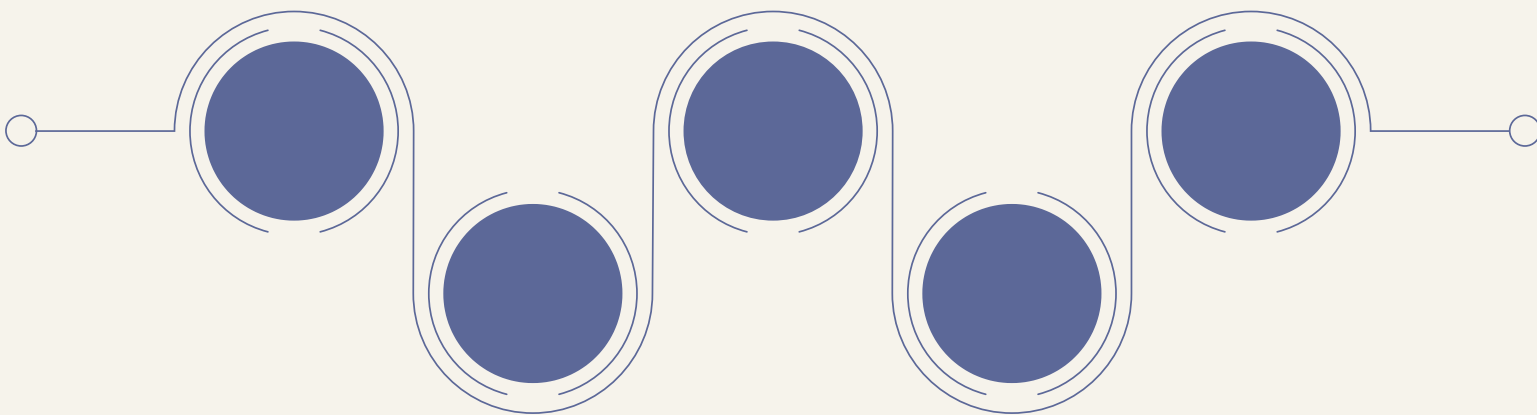




IMPLEMENTASI DAN ANALISIS NESTED VIRTUALIZATION DENGAN PROXMOX VE PADA INFRASTRUKTUR MIKROTIK

By Ahmad Indihome





Anggota Kelompok

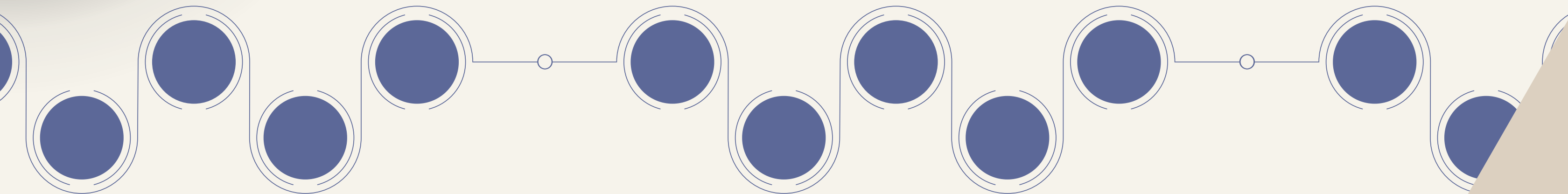


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Latar Belakang

Virtualisasi merupakan teknologi penting untuk efisiensi sumber daya dan isolasi sistem. Nested Virtualization memungkinkan hypervisor berjalan di dalam virtual machine lain, sehingga ideal untuk simulasi lingkungan cloud, pengujian jaringan, dan pembelajaran teknologi virtualisasi tanpa memerlukan banyak perangkat fisik.

Proyek ini mengimplementasikan nested virtualization menggunakan Mikrotik sebagai router, VirtualBox sebagai hypervisor tingkat pertama, Proxmox VE sebagai hypervisor tingkat kedua, dan Ubuntu Server sebagai guest VM. Tujuannya adalah membangun lingkungan lab virtual yang terisolasi, terhubung internet, dan siap digunakan untuk eksperimen lebih lanjut.



Rumusan Masalah dan Tujuan

Rumusan Masalah :

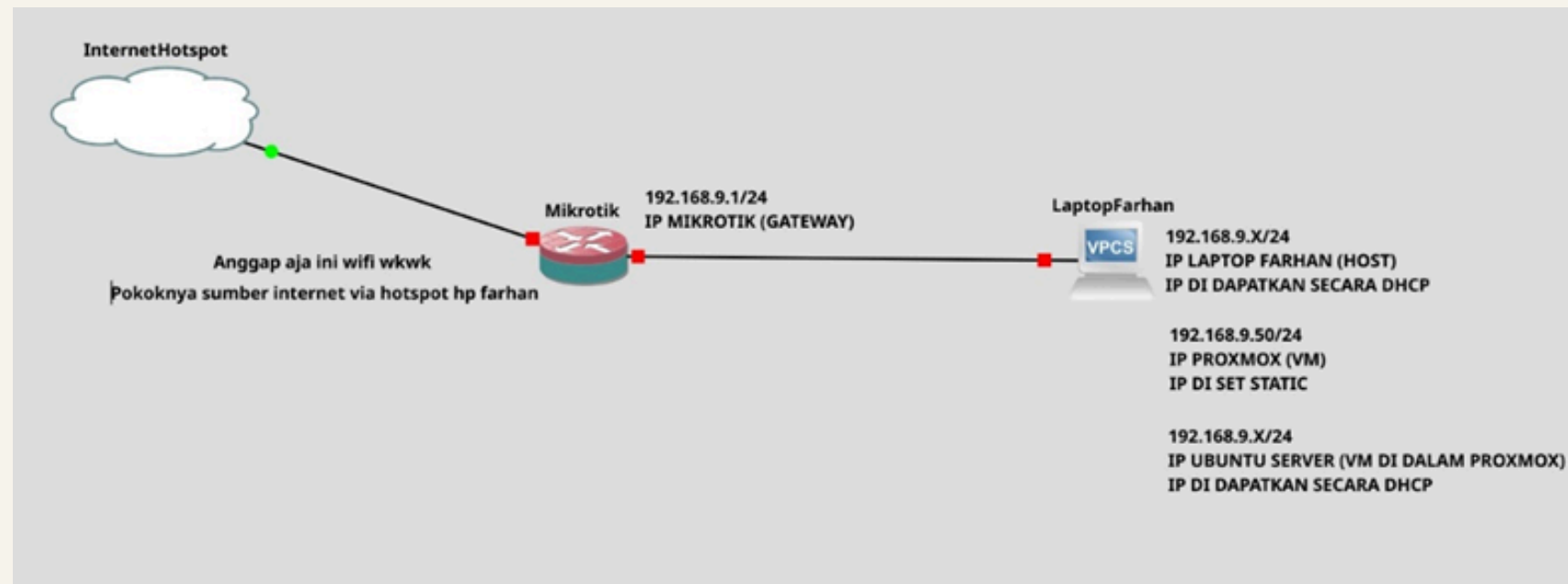
1. Bagaimana membangun jaringan lab virtual dengan Mikrotik?
2. Bagaimana konfigurasi VirtualBox untuk nested virtualization?
3. Bagaimana instalasi dan konfigurasi Proxmox VE di dalam VirtualBox?
4. Bagaimana menguji integrasi seluruh lapisan?

Tujuan :

1. Membuat jaringan 192.168.9.0/24 dengan akses internet.
2. Menyiapkan VM dengan dukungan nested virtualization.
3. Instalasi Proxmox dengan IP statis.
4. Menguji konektivitas, snapshot, backup, dan performa.

Arsitektur Sistem

Topologi Jaringan :



Arsitektur Sistem :

1. Sumber Internet: Hotspot dari HP Farhan.
2. Router/Gateway: Mikrotik dengan IP 192.168.9.1/24.
3. Jaringan Lokal: Subnet 192.168.9.0/24 yang terisolasi.
4. Host: Laptop Farhan mendapat IP via DHCP dari Mikrotik.
5. Hypervisor L2: Proxmox VE di-set dengan IP statis 192.168.9.50.
6. Guest VM: Ubuntu Server di dalam Proxmox mendapat IP via DHCP dari Mikrotik.

Konsep Konektivitas :

1. Mikrotik menghubungkan jaringan lokal ke internet via hotspot.
2. Semua perangkat (host, VM, nested VM) berada dalam subnet yang sama.
3. VirtualBox di-bridge ke jaringan fisik via USB LAN dongle.
4. Proxmox dan Ubuntu dapat diakses langsung dari host laptop.

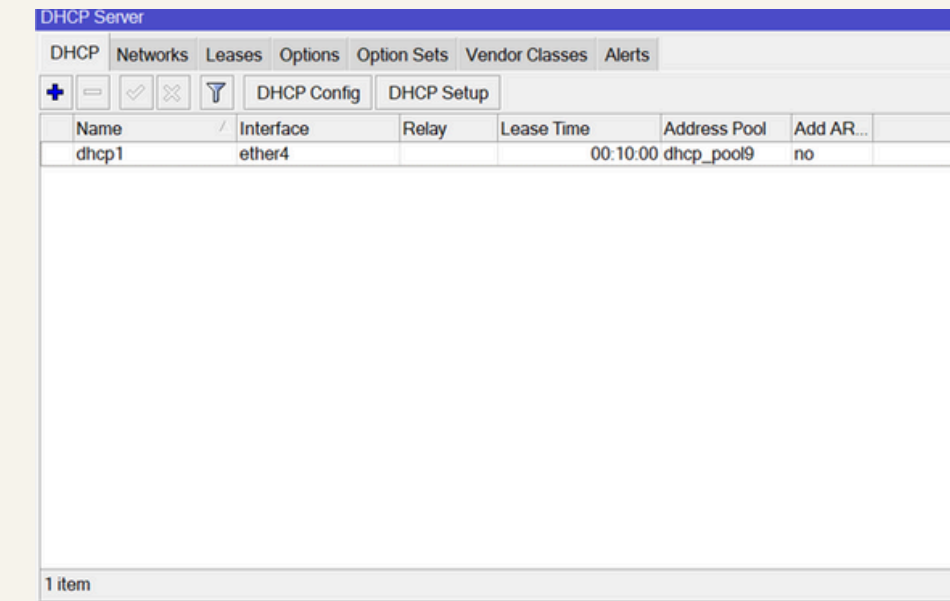
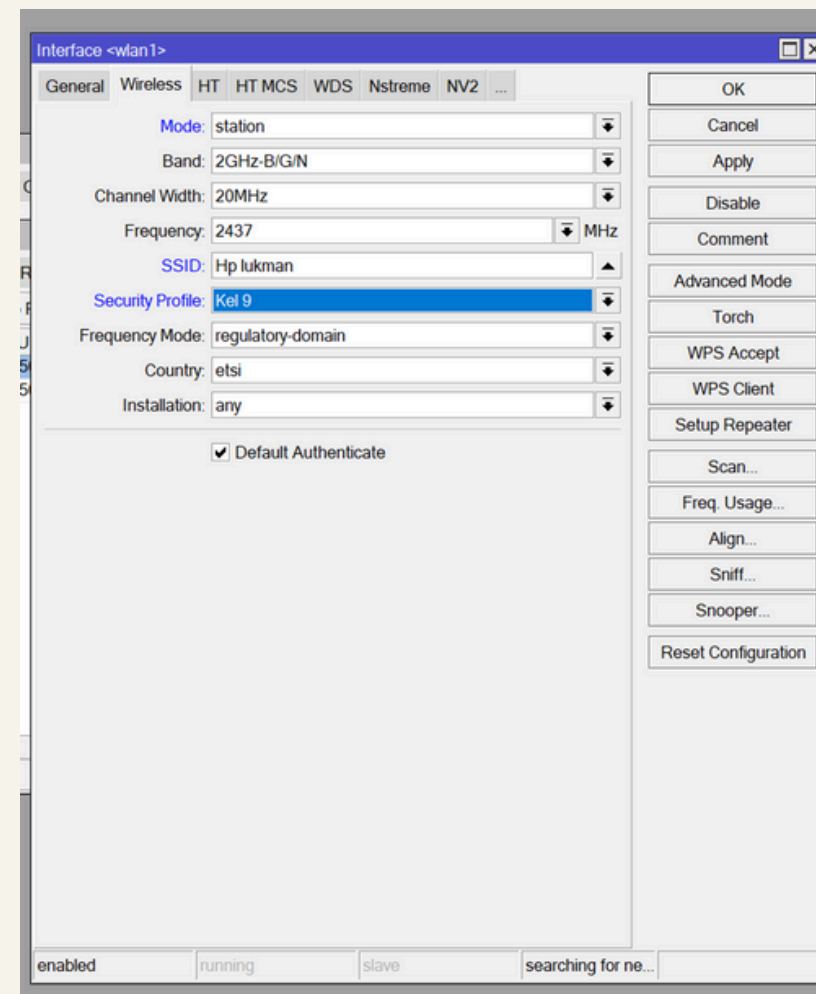
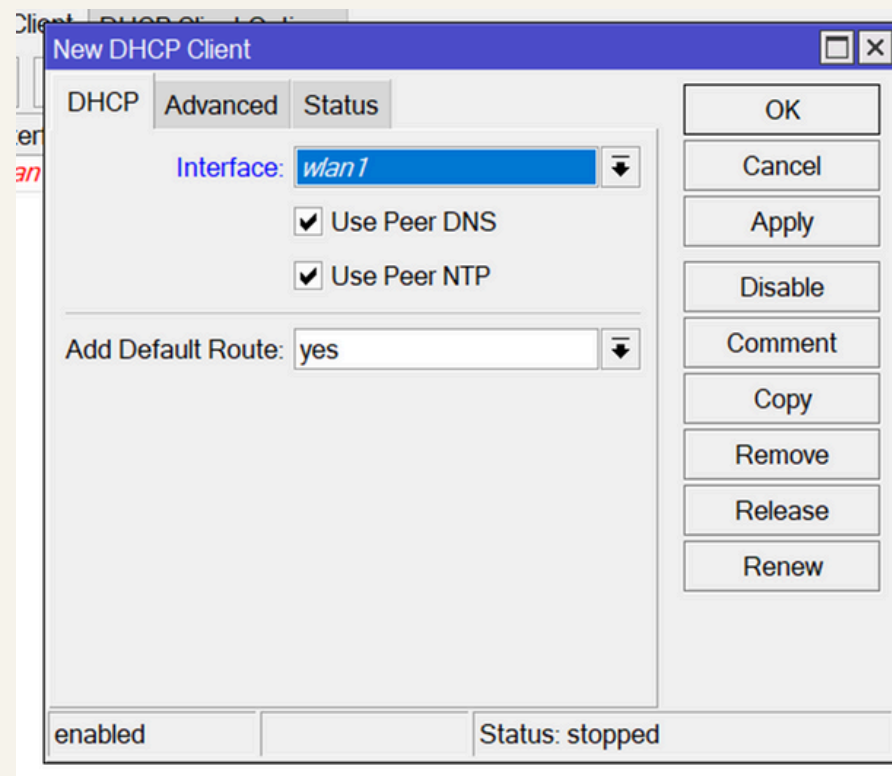
Spesifikasi Resource :

1. VirtualBox VM: 6 GB RAM, 2 Core CPU, 50 GB Disk.
2. Proxmox VE: IP Static 192.168.9.50.
3. Guest VM (Ubuntu): 2 GB RAM, 2 Core CPU (Type: Host).

Konfigurasi Mikrotik

Langkah-langkah:

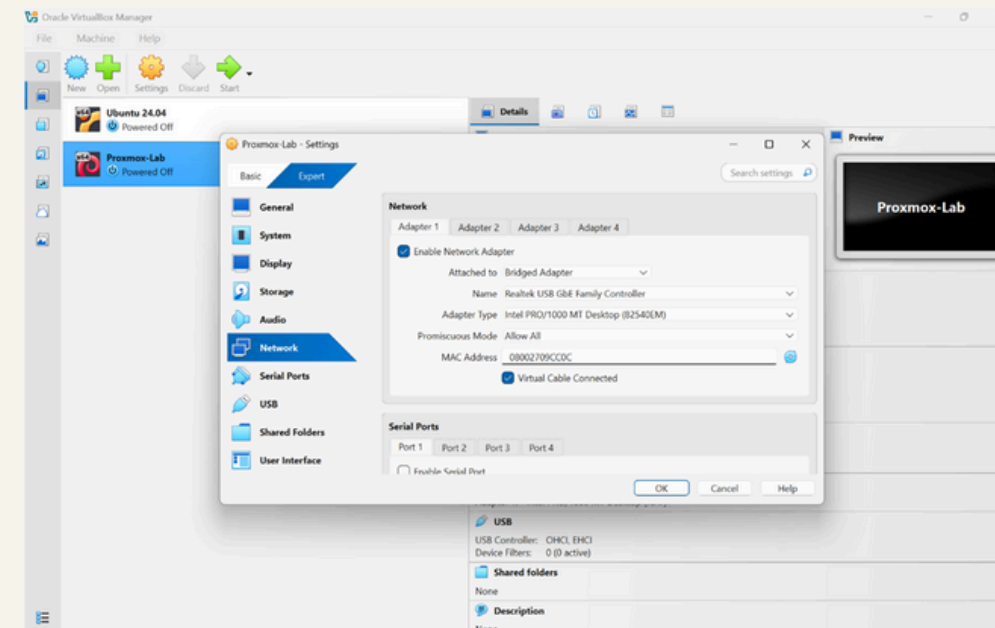
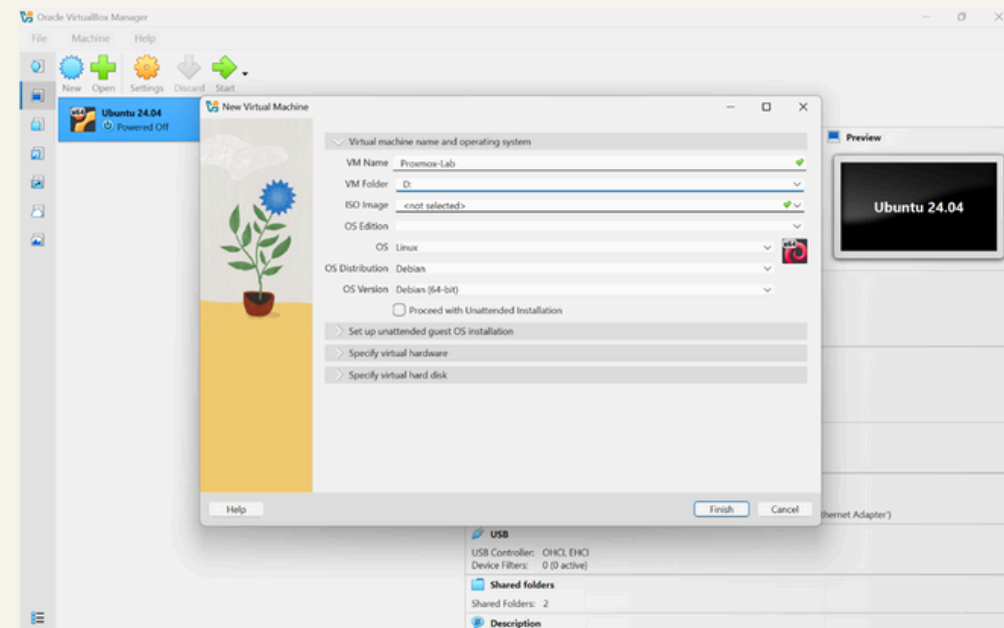
1. Setup koneksi internet via Wi-Fi (WLAN1)
2. Setup jaringan lokal pada ether5 (192.168.9.0/24)
3. Konfigurasi DHCP Server dan NAT (Masquerade)



Konfigurasi VirtualBox

Langkah-langkah:

1. Pemasangan kabel & verifikasi jaringan
2. Pembuatan VM Proxmox-Lab
3. Network Bridging ke USB LAN Dongle
4. Aktivasi AMD-V Nested via CLI



```
Administrator: Command Prompt
C:\Program Files\Oracle\VirtualBox>VBoxManage.exe modifyvm Proxmox-Lab --nested-hw-virt on
C:\Program Files\Oracle\VirtualBox>
```

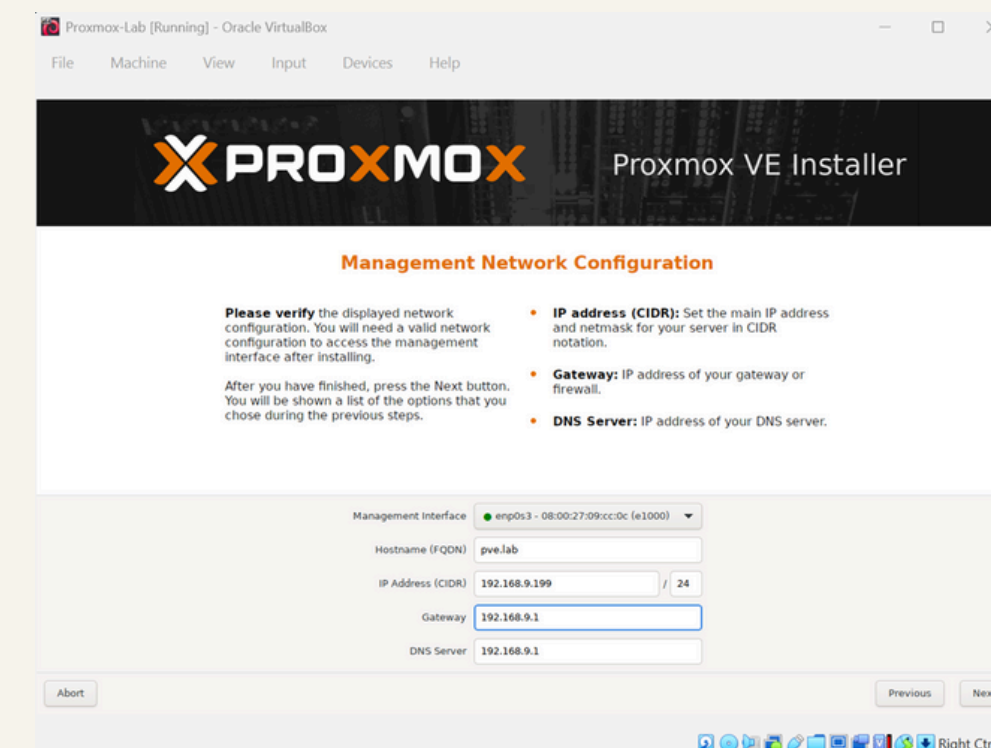
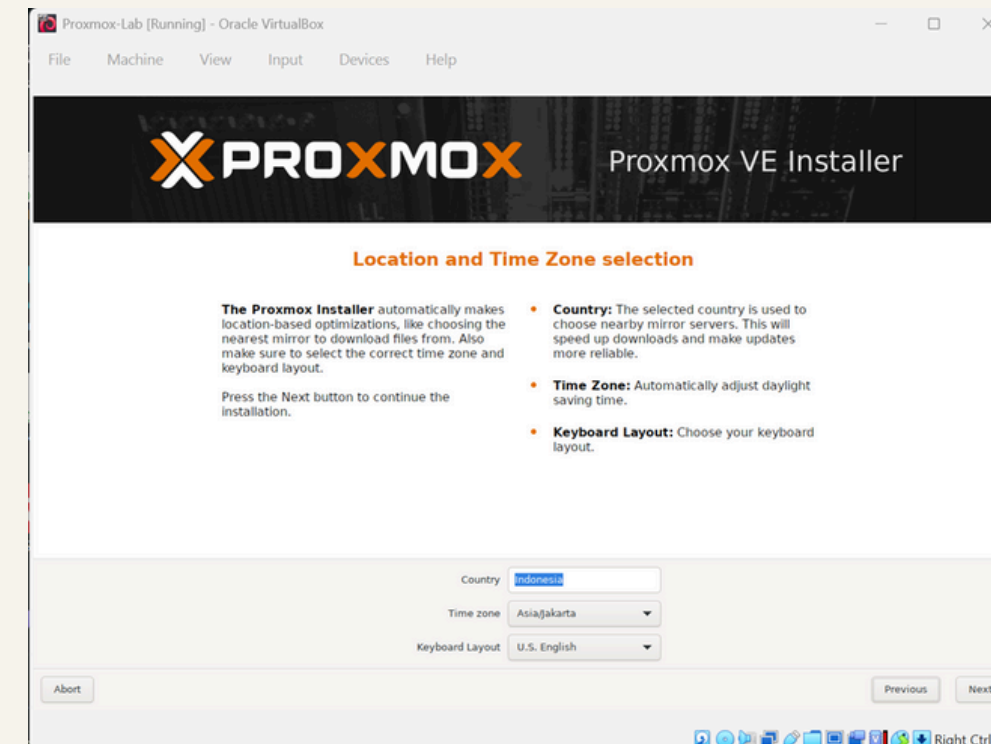
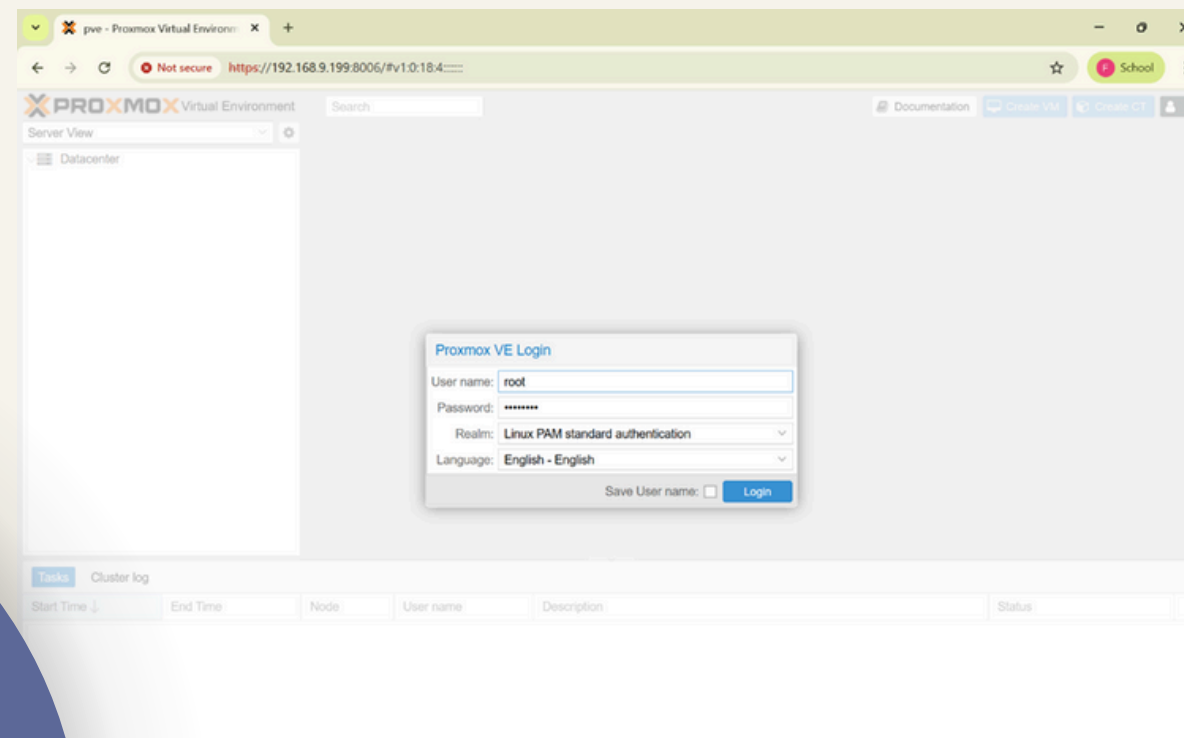
Instalasi Proxmox VE

Proses Instalasi:

- Pilih ISO Proxmox VE
- Atur IP statis: 192.168.9.50
- Gateway: 192.168.9.1
- DNS: 192.168.9.1 & 8.8.8.8

Akses:

<https://192.168.9.50:8006>



Guest VM Ubuntu

Langkah-langkah:

1. Buat VM baru di Proxmox
2. Pilih ISO Ubuntu Server
3. Atur CPU Type: Host
4. Install Ubuntu Minimal dengan OpenSSH

The screenshot shows the 'Create: Virtual Machine' window with the 'General' tab selected. The 'Node' is set to 'pve', 'VM ID' is '100', and 'Name' is 'Ubuntu-server-9'. The 'Resource Pool' is empty. The 'Start at boot' checkbox is unchecked. The 'Start/Shutdown order' is set to 'any', 'Startup delay' is 'default', and 'Shutdown timeout' is 'default'. The 'Tags' section shows 'No Tags' with a '+' button. At the bottom, there are 'Help', 'Advanced' (checked), 'Back', and 'Next' buttons.

The screenshot shows the 'Create: Virtual Machine' window with the 'OS' tab selected. The 'Use CD/DVD disc image file (iso)' radio button is selected. The 'Storage' is set to 'local', and the 'ISO image' is 'ubuntu-22.04.5-live-se'. The 'Guest OS' section shows 'Type' as 'Linux' and 'Version' as '6.x - 2.6 Kernel'. The 'Use physical CD/DVD Drive' and 'Do not use any media' radio buttons are unselected. At the bottom, there are 'Advanced' (checked), 'Back', and 'Next' buttons.

The screenshot shows the 'Create: Virtual Machine' window with the 'CPU' tab selected. The 'Sockets' is set to '1' and 'Type' is 'host'. The 'Cores' is set to '2' and 'Total cores' is '2'. The 'VCPUs' is set to '2' and 'CPU units' is '100'. The 'CPU limit' is 'unlimited' and 'Enable NUMA' is unchecked. The 'CPU Affinity' is set to 'All Cores'. The 'Extra CPU Flags' section shows a list of flags with radio buttons: 'md-clear', 'pcid', 'spec-ctrl', 'ssbd', 'ibpb', and 'virt-ssbd'. At the bottom, there are 'Help', 'Advanced' (checked), 'Back', and 'Next' buttons.

The screenshot shows the 'Choose the type of installation' screen in the Ubuntu Server installer. The 'Ubuntu Server' option is selected. The 'Additional options' section shows 'Search for third-party drivers' selected. The 'Done' and 'Back' buttons are at the bottom.

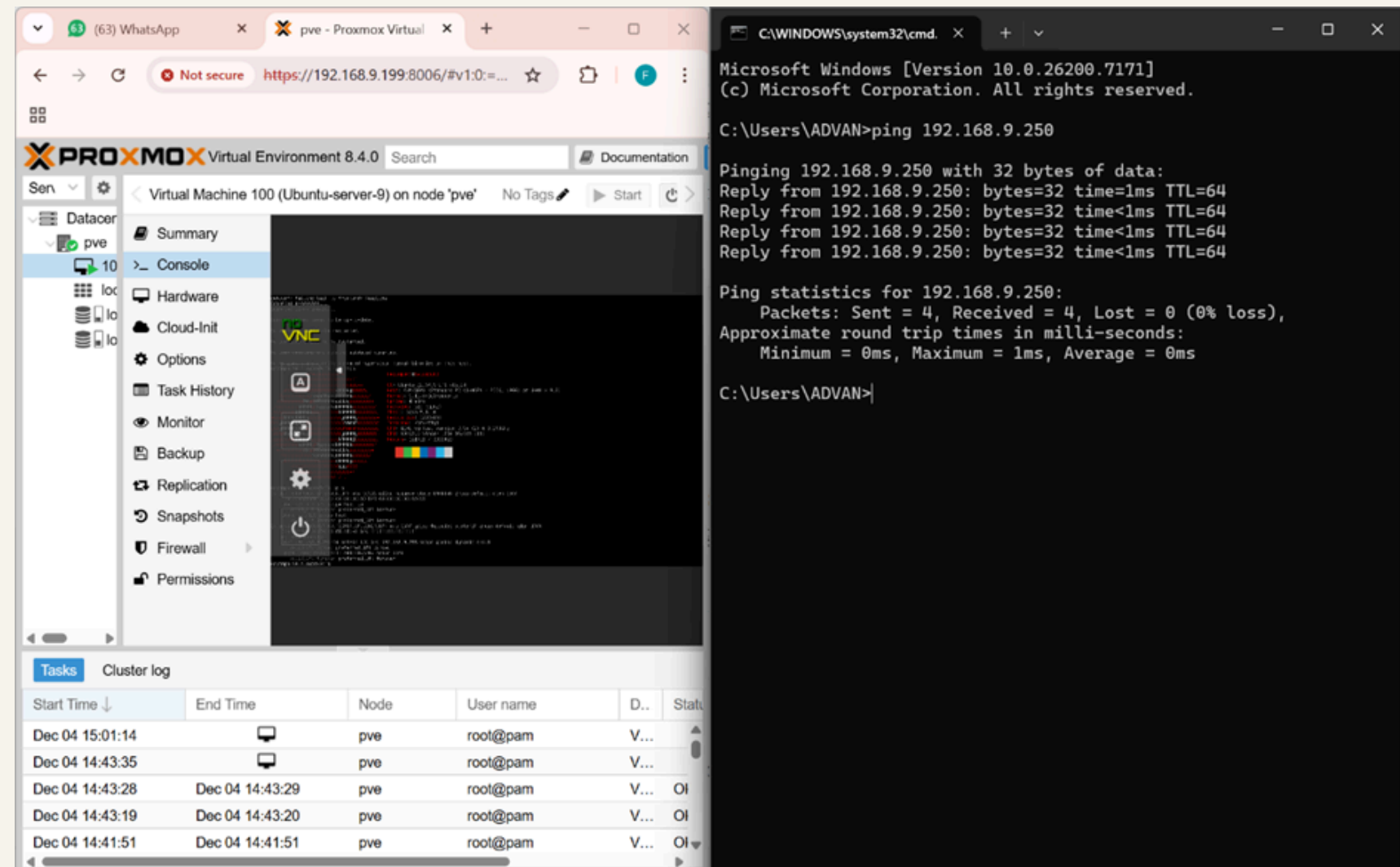
The screenshot shows the 'SSH configuration' screen in the Ubuntu Server installer. The 'Install OpenSSH server' option is selected. The 'Allow password authentication over SSH' option is also selected. The 'Import SSH key' button is visible. The 'AUTHORIZED KEYS' section shows 'No authorized key'. The 'Done' and 'Back' buttons are at the bottom.

Uji Integrasi Jaringan

Skenario: Ping dari laptop ke VM Ubuntu

Hasil: Reply dari 192.168.9.253

Kesimpulan: Jaringan multilayer berfungsi dengan baik.



The image shows a Proxmox Virtual Environment (PVE) interface on the left and a Windows command prompt on the right. The PVE interface displays the configuration for a virtual machine named '100 (Ubuntu-server-9)' on node 'pve'. The 'Console' tab is active, showing a terminal window with a VNC viewer. The Windows command prompt shows the execution of a ping command from a Windows machine to the IP address 192.168.9.250. The output shows four successful replies from 192.168.9.250, indicating a successful network connection.

```
Microsoft Windows [Version 10.0.26200.7171]
(c) Microsoft Corporation. All rights reserved.

C:\Users\ADVAN>ping 192.168.9.250

Pinging 192.168.9.250 with 32 bytes of data:
Reply from 192.168.9.250: bytes=32 time=1ms TTL=64
Reply from 192.168.9.250: bytes=32 time<1ms TTL=64
Reply from 192.168.9.250: bytes=32 time<1ms TTL=64
Reply from 192.168.9.250: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.9.250:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\Users\ADVAN>
```

Uji Snapshot & Rollback

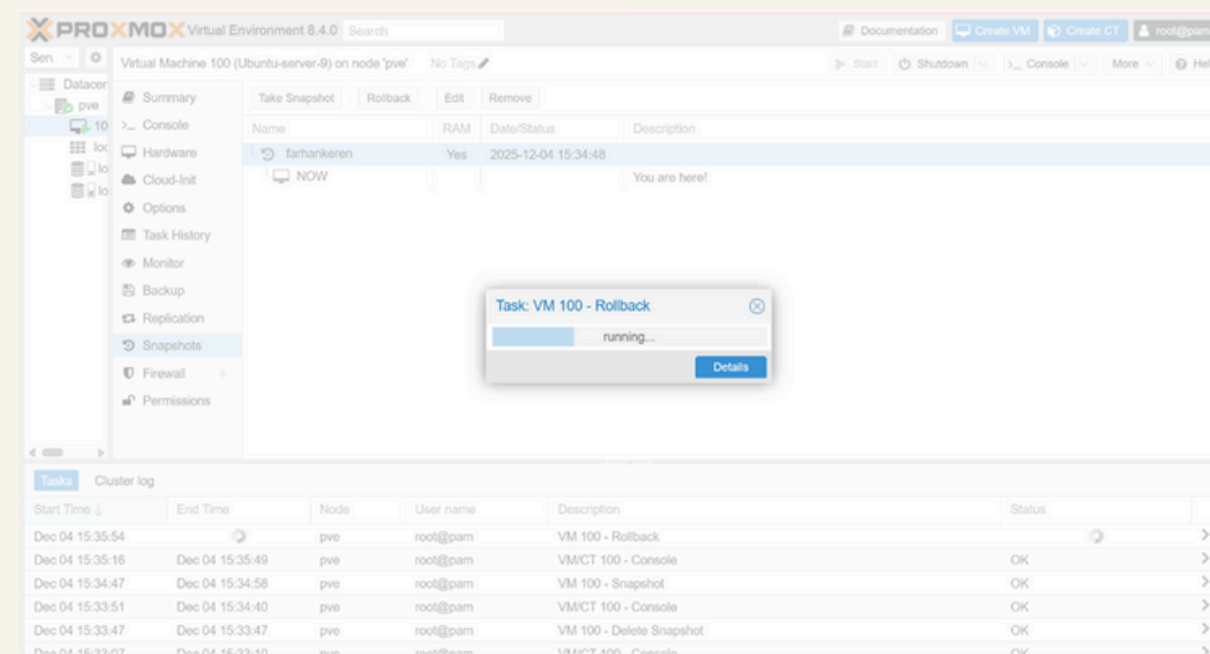
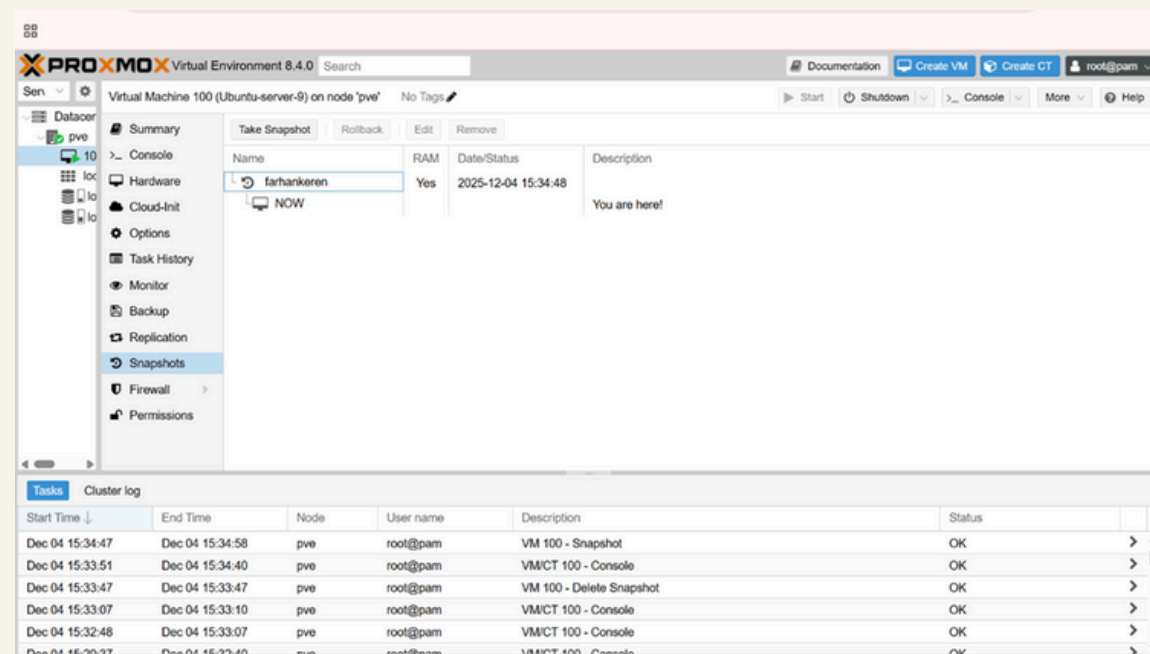
Skenario:

1. Buat file fakta.txt di Ubuntu
2. Ambil snapshot di Proxmox
3. Hapus file
4. Rollback snapshot

Hasil: File kembali muncul

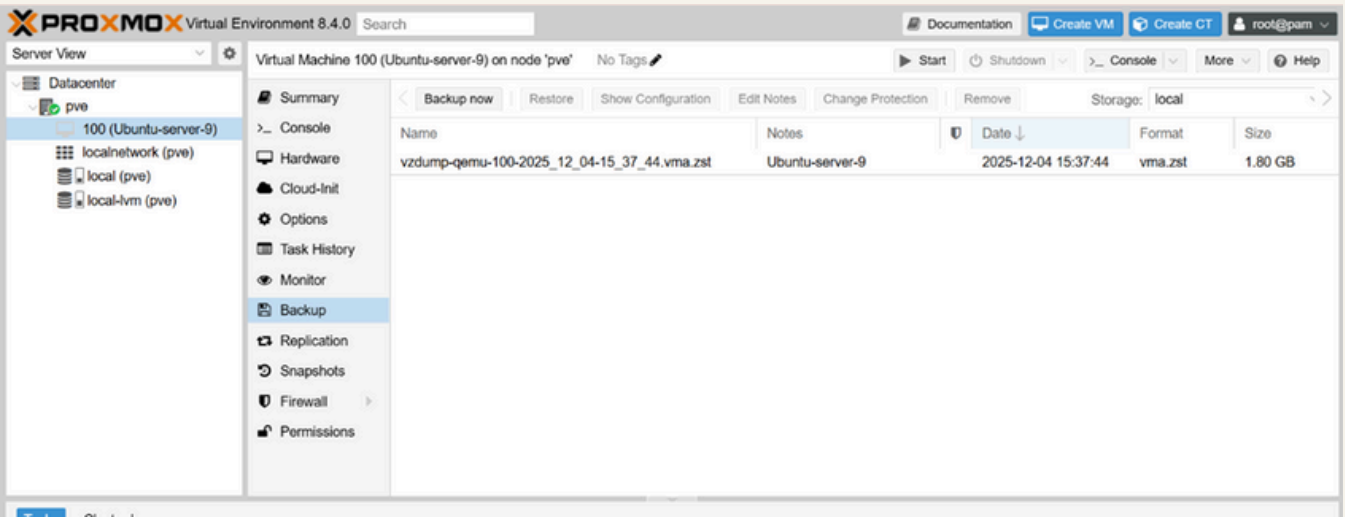
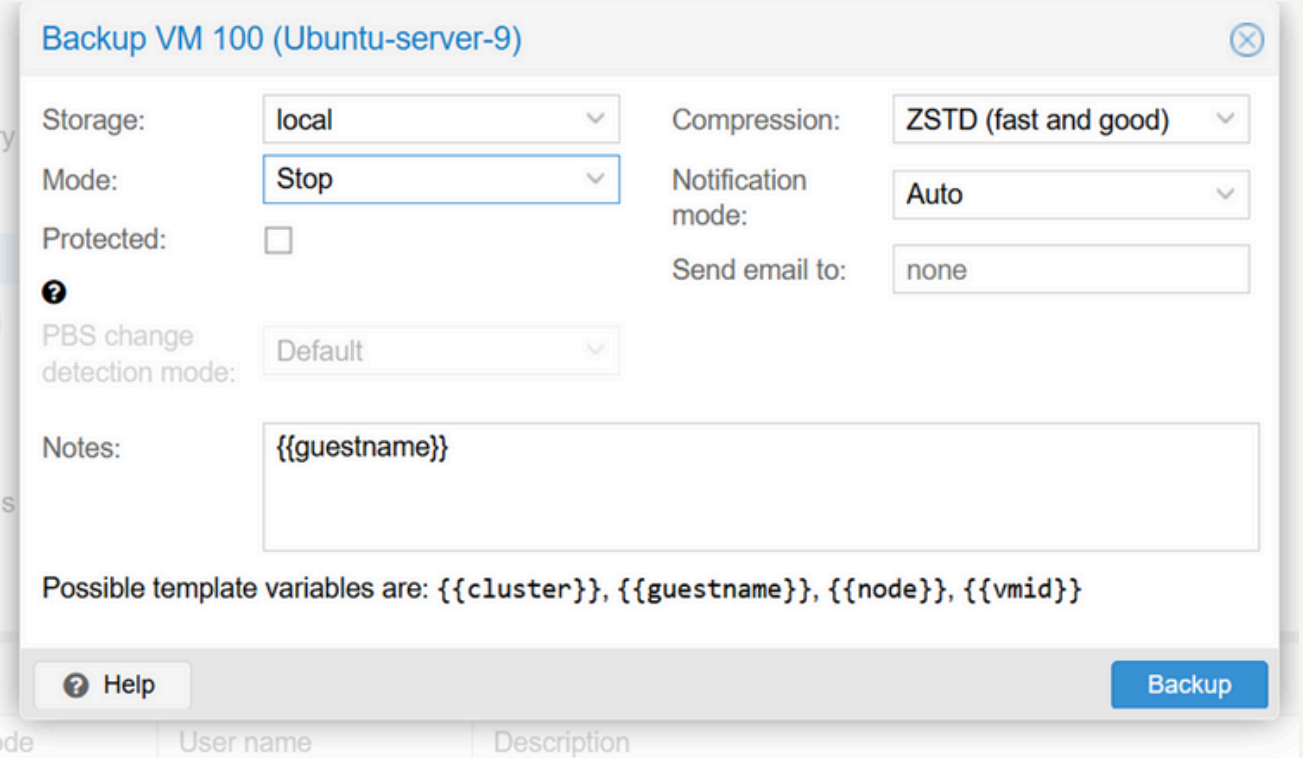
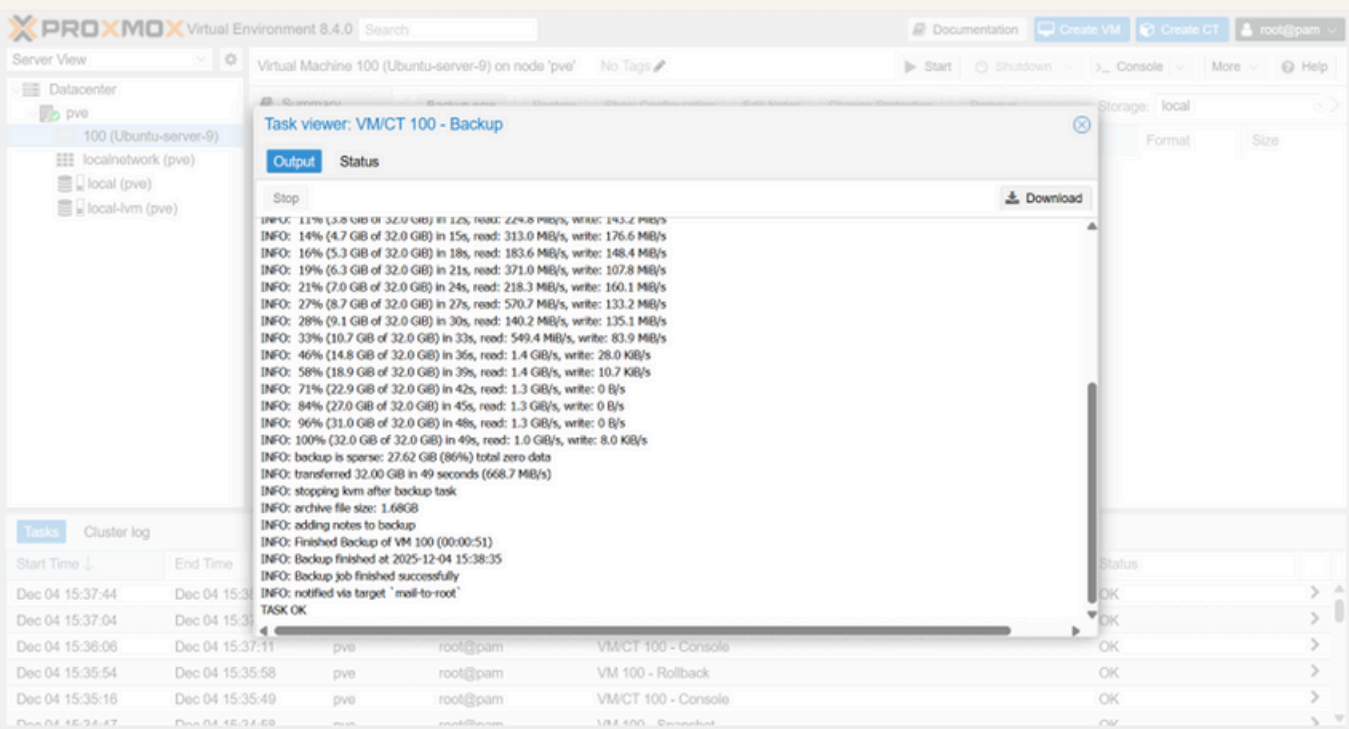
Kesimpulan: Fitur snapshot/rollback berjalan normal.

```
kelompok9@kelompok9:~$ echo "farhankeren" > fakta.txt
kelompok9@kelompok9:~$ rm fakta.txt
kelompok9@kelompok9:~$
```



Uji Backup

Skenario: Backup VM Ubuntu dengan mode stop
Hasil: Log TASK OK, file backup tersimpan
Kesimpulan: Backup berhasil dilakukan.

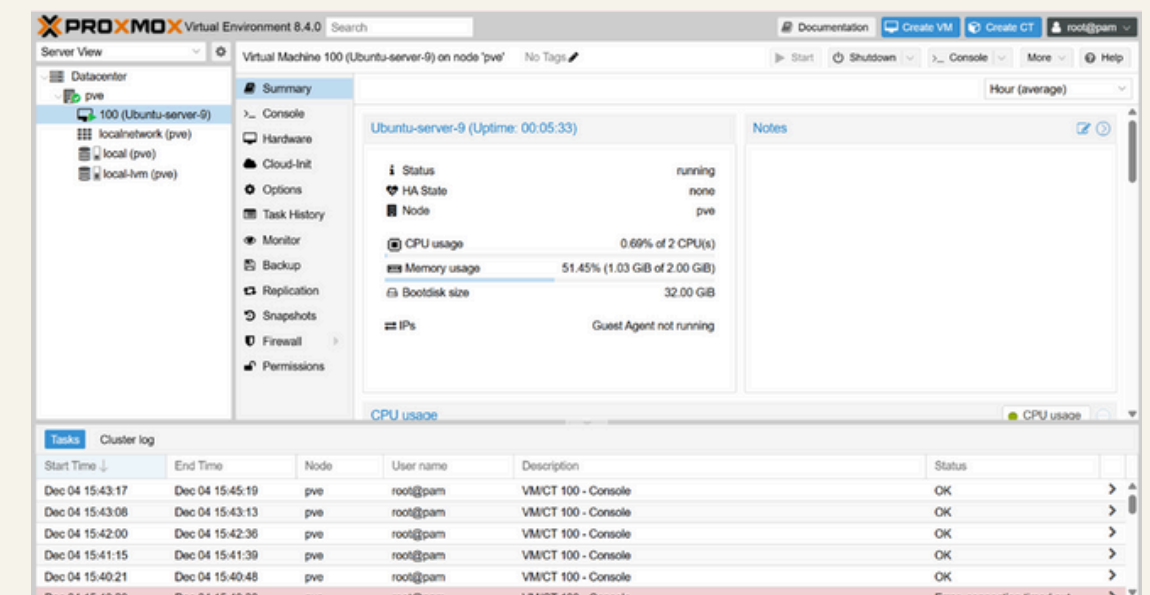
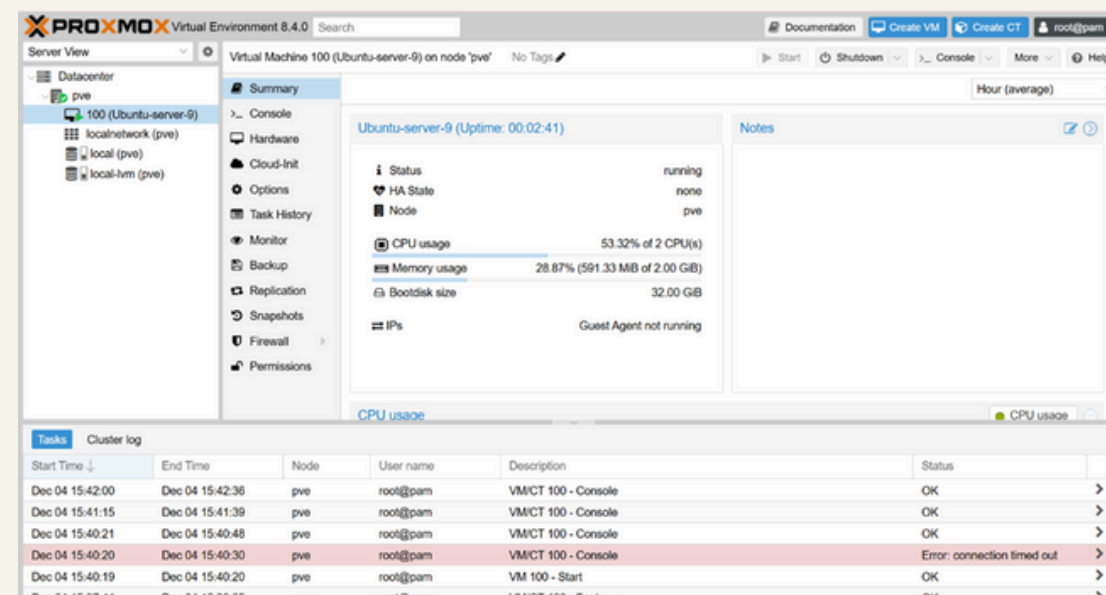
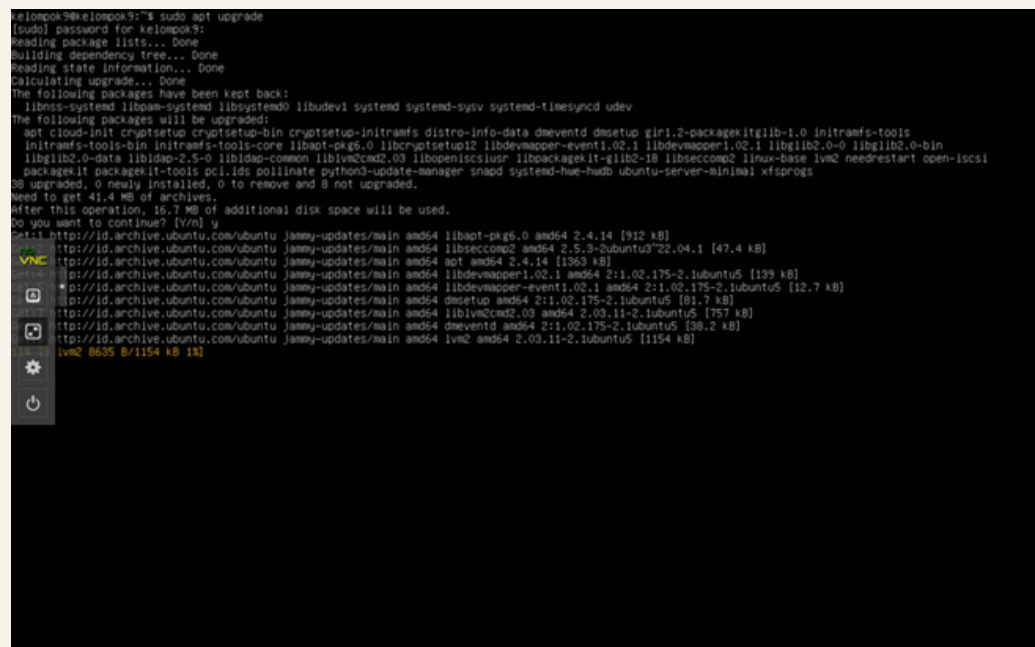
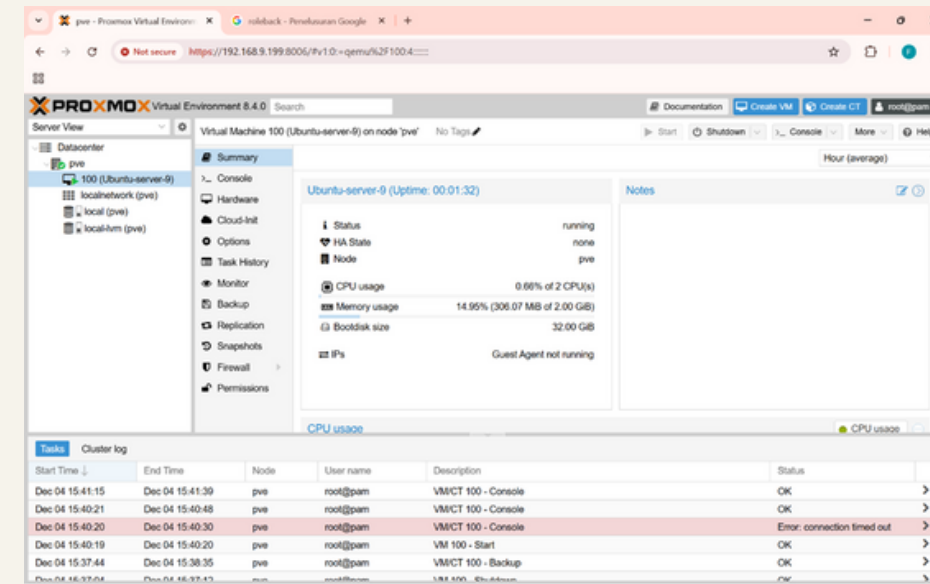


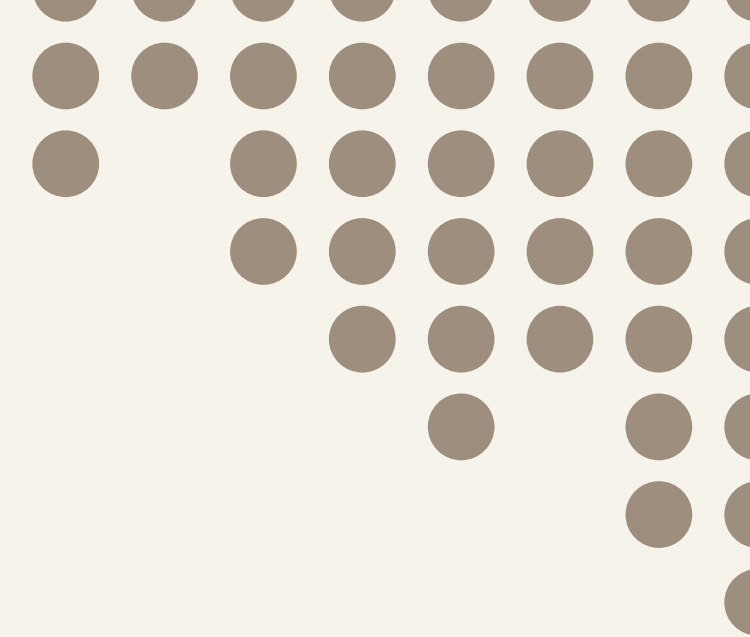
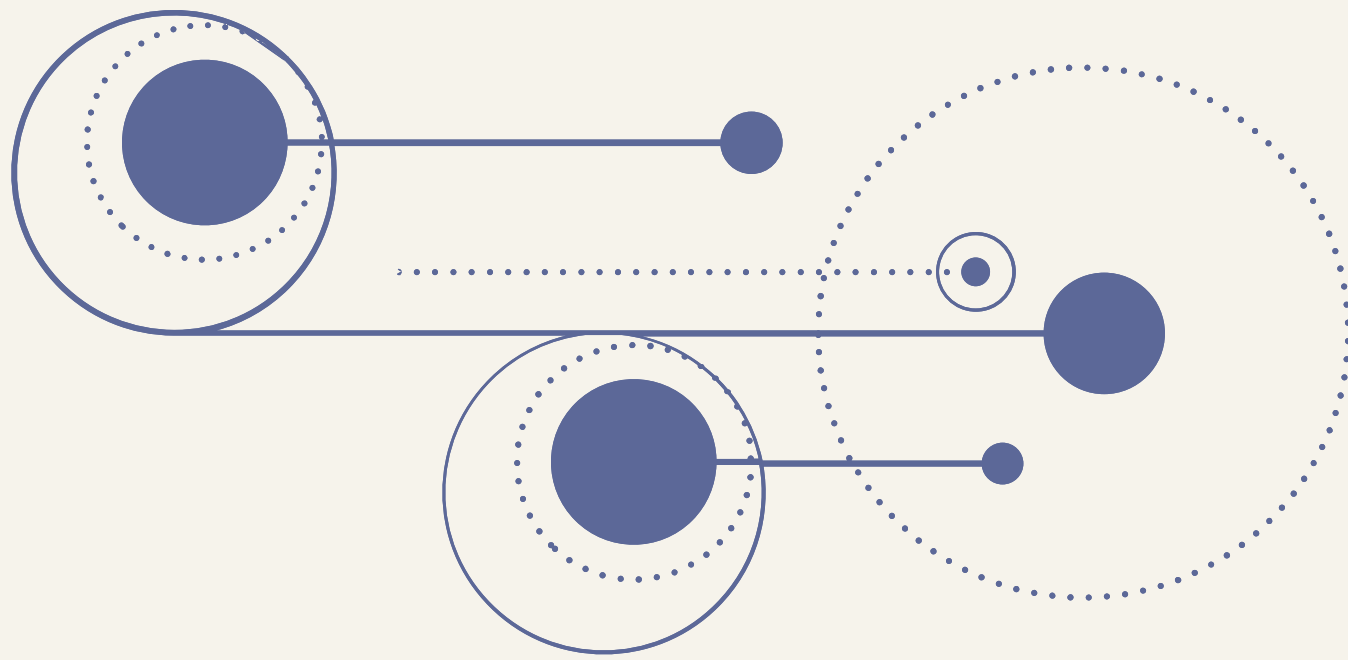
Analisis Performa

Hasil Pengujian:

- CPU idle: 2-4%
- CPU under load: ~40%
- RAM usage: ~3.5 GB dari 6 GB

Kesimpulan: Performa stabil dengan overhead yang wajar.





Kesimpulan

Implementasi nested virtualization dengan Mikrotik, VirtualBox, Proxmox VE, dan Ubuntu Server berhasil dilakukan dengan hasil yang memuaskan. Seluruh lapisan arsitektur terintegrasi dengan baik, fitur snapshot dan backup berfungsi normal, serta performa sistem stabil meskipun berjalan pada hardware terbatas. Lingkungan lab virtual yang terbentuk telah siap digunakan untuk pembelajaran, pengujian, dan pengembangan lebih lanjut di bidang virtualisasi dan jaringan.





THANK YOU

