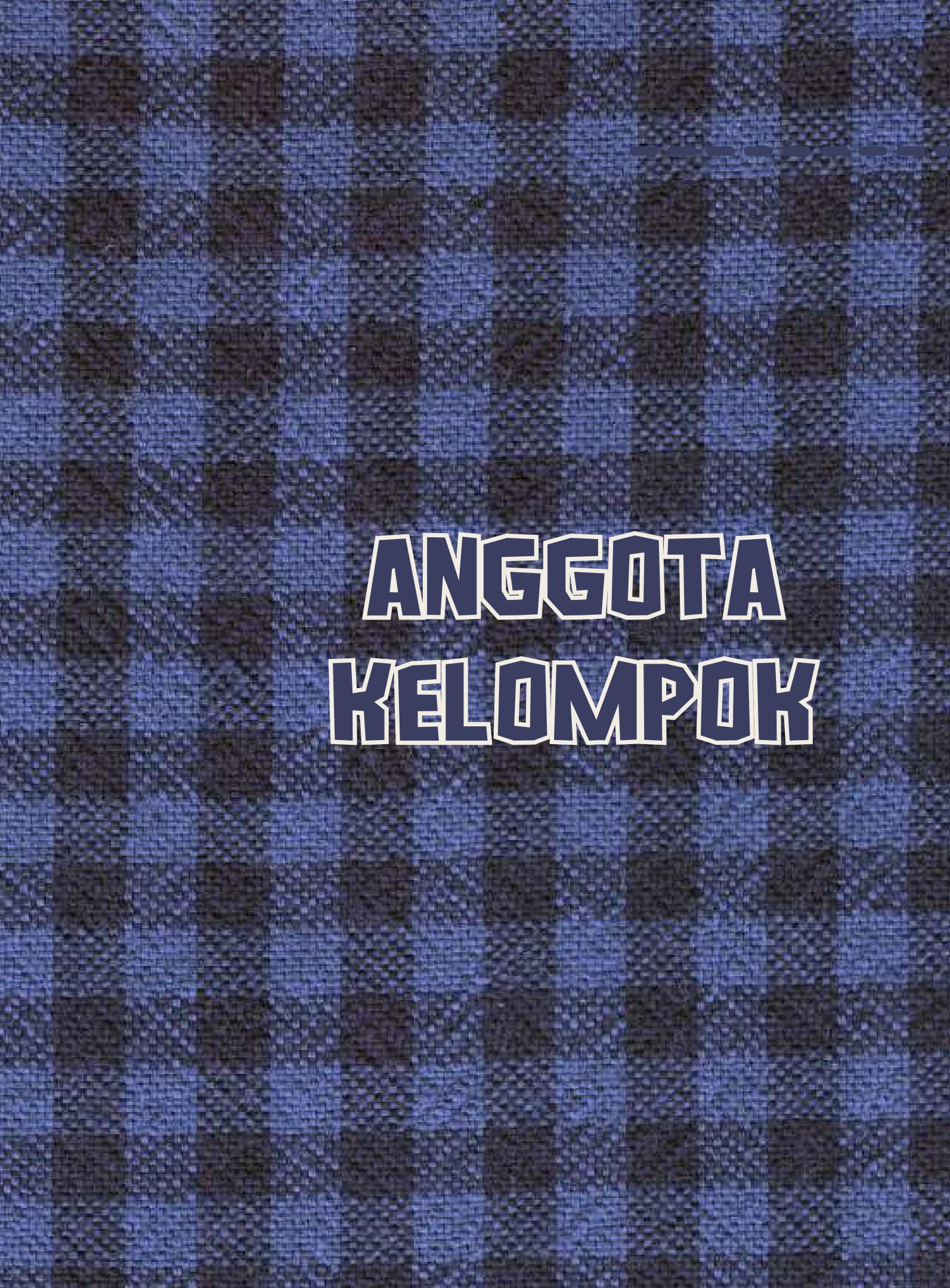


MEMBANGUN PRIVATE CLOUD CLUSTER DENGAN PROXMOX VE

Disusun oleh Kelompok 8



ANGGOTA KELompok

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LATAR BELAKANG

Transformasi teknologi informasi telah mendorong organisasi dan institusi pendidikan untuk beralih dari penggunaan server fisik tunggal ke infrastruktur virtual dan cloud. Virtualisasi memungkinkan efisiensi sumber daya, kemudahan manajemen, serta fleksibilitas dalam penyediaan layanan, termasuk kemampuan menjalankan banyak sistem operasi secara terisolasi pada satu perangkat keras. Dengan penerapan cluster dan storage bersama, infrastruktur menjadi lebih scalable dan resilient serta mampu meminimalkan downtime melalui mekanisme failover dan live migration. Proxmox Virtual Environment (Proxmox VE) sebagai platform virtualisasi open-source mendukung cluster multi-node, shared storage, high availability, dan live migration, sehingga sangat relevan digunakan dalam konteks akademik untuk mengintegrasikan teori virtualisasi, cluster, dan manajemen infrastruktur berbasis cloud ke dalam praktik langsung.

RUMUSAN MASALAH

1. Bagaimana merancang arsitektur private cloud cluster menggunakan Proxmox VE?
2. Bagaimana melakukan instalasi dan konfigurasi Proxmox VE pada multi-node?
3. Bagaimana membangun storage bersama berbasis ZFS?
4. Bagaimana menguji live migration antar-node?
5. Bagaimana memastikan sistem mendukung high availability dan failover?

TUJUAN

1. Merancang arsitektur private cloud cluster yang stabil dan scalable
2. Mengonfigurasi Proxmox VE pada lingkungan multi-node
3. Mengintegrasikan storage bersama berbasis ZFS
4. Menguji proses live migration VM tanpa downtime
5. Menguji kestabilan cluster dan mekanisme HA

PROXMOX VE

Proxmox VE adalah platform virtualisasi open-source berbasis Debian yang mendukung:

1. KVM untuk virtual machine
2. LXC untuk container
3. Manajemen terpusat berbasis web
4. Cluster multi-node
5. Live migration
6. High Availability (HA)
7. Dukungan storage fleksibel (ZFS, Ceph, NFS, iSCSI)

CLUSTER DAN HIGH AVAILABILITY

1. Cluster adalah kumpulan beberapa node yang dikelola sebagai satu sistem
2. High Availability memastikan layanan tetap berjalan meskipun terjadi kegagalan node
3. Proxmox VE menggunakan:
 - a. Corosync
 - b. Shared storage
 - c. HA Manager
4. VM dapat direstart atau dipindahkan otomatis ke node lain

STORAGE BERSAMA {ZFS}

ZFS merupakan filesystem dan volume manager yang:

1. Mendukung snapshot dan integritas data
2. Cocok untuk cluster kecil hingga menengah
3. Konfigurasi lebih sederhana dibanding Ceph
4. Mendukung live migration jika digunakan sebagai shared storage

LIVE MIGRATION

Live migration adalah proses memindahkan VM yang sedang berjalan tanpa mematikan VM.

Kegunaan live migration:

1. Maintenance node
2. Load balancing
3. Failover manual
4. Menghindari downtime layanan

Syarat utama: Menggunakan shared storage

VIRTUALISASI SERVER

Virtualisasi server memungkinkan:

1. Menjalankan banyak OS dalam satu hardware
2. Efisiensi resource
3. Fleksibilitas deployment
4. Mendukung HA dan disaster recovery

Proxmox VE menggunakan:

1. KVM (full virtualization)
2. LXC (container)

ARSITEKTUR SISTEM

1. Menggunakan 2 node Proxmox VE
2. Shared storage berbasis ZFS
3. Terhubung melalui jaringan lokal (WiFi)
4. Mendukung komunikasi cluster dan live migration

Node:

- Node 1 (Miris) – 192.168.1.45
- Node 2 (Kel8) – 192.168.1.44

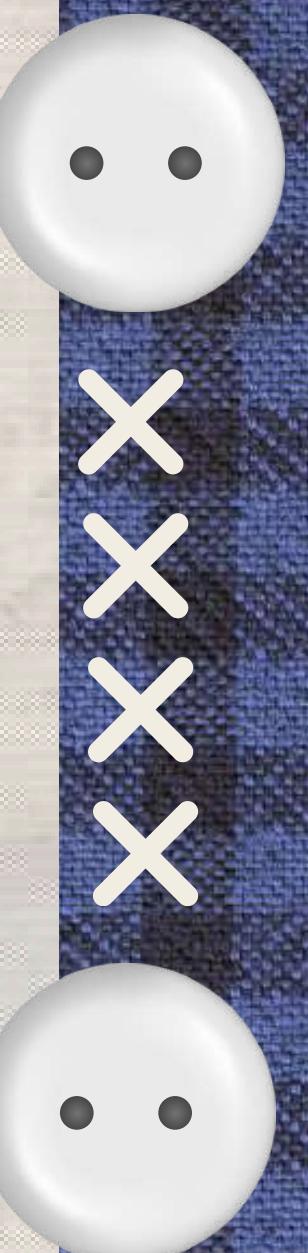
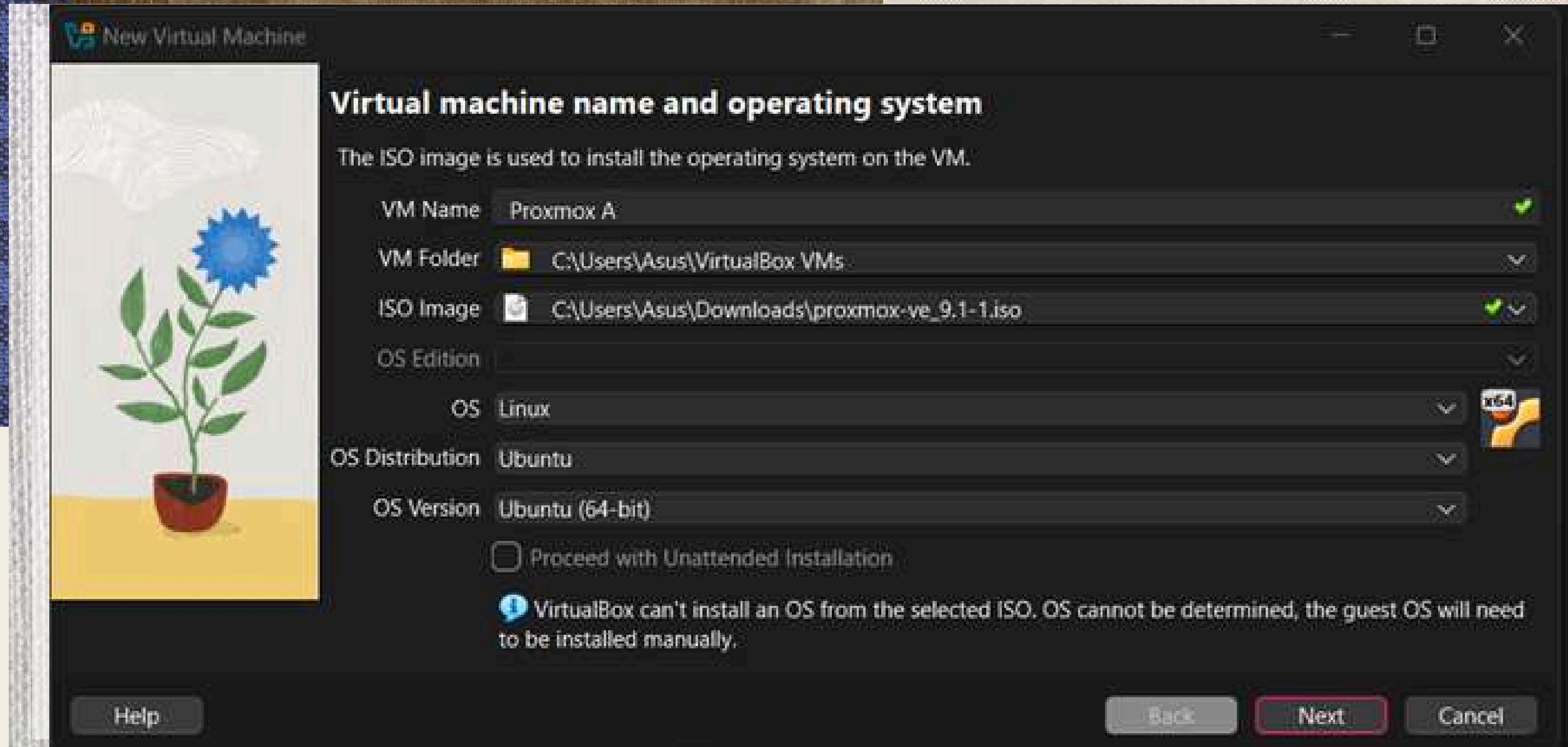
KOMPONEN SISTEM

1. Node Proxmox VE: server virtualisasi
2. Shared Storage ZFS: menyimpan disk VM
3. Cluster Network: komunikasi antar-node
4. HA Manager: menjaga ketersediaan VM

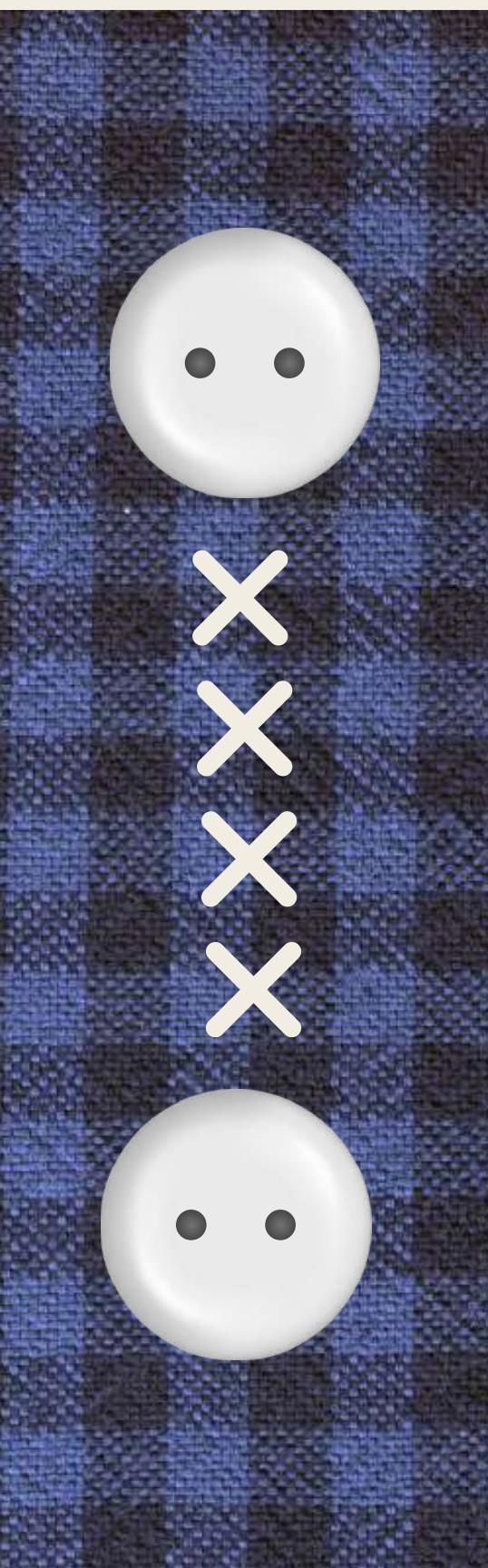
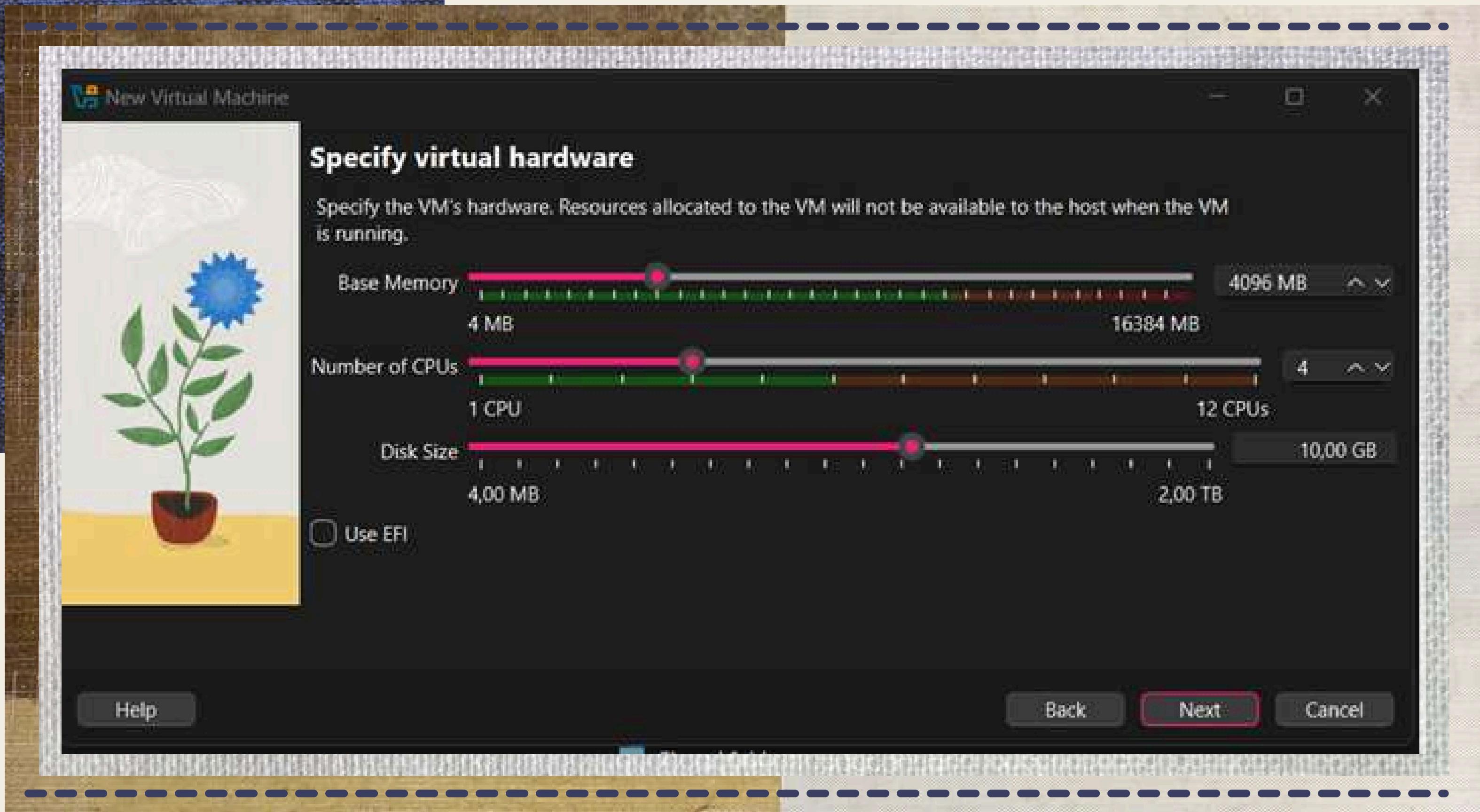
SKEMA PROSES

Seluruh tahapan dilakukan secara bertahap untuk memastikan sistem berjalan stabil dan virtual machine tetap aktif tanpa downtime selama proses migrasi. Untuk proses tahapan nya ada pada slide selanjutnya.

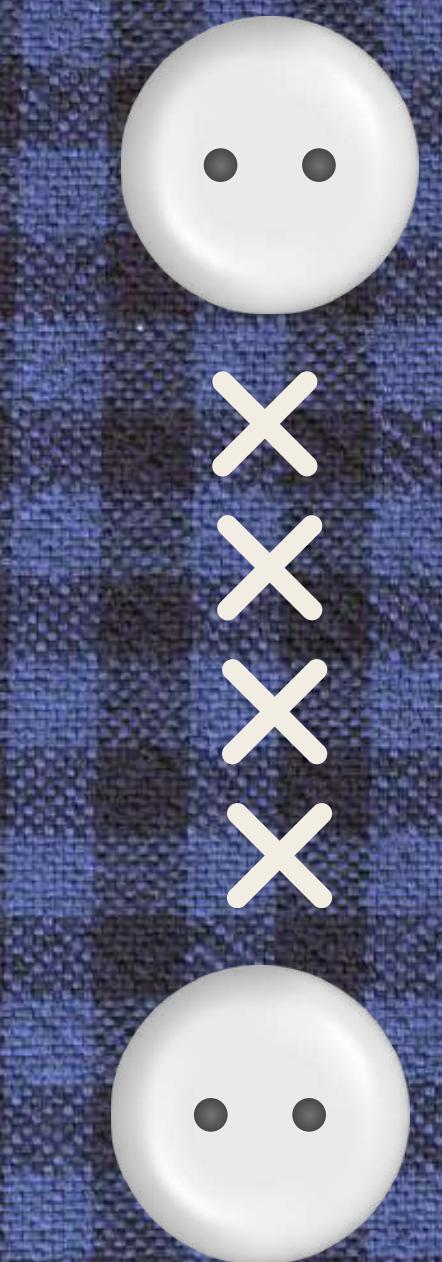
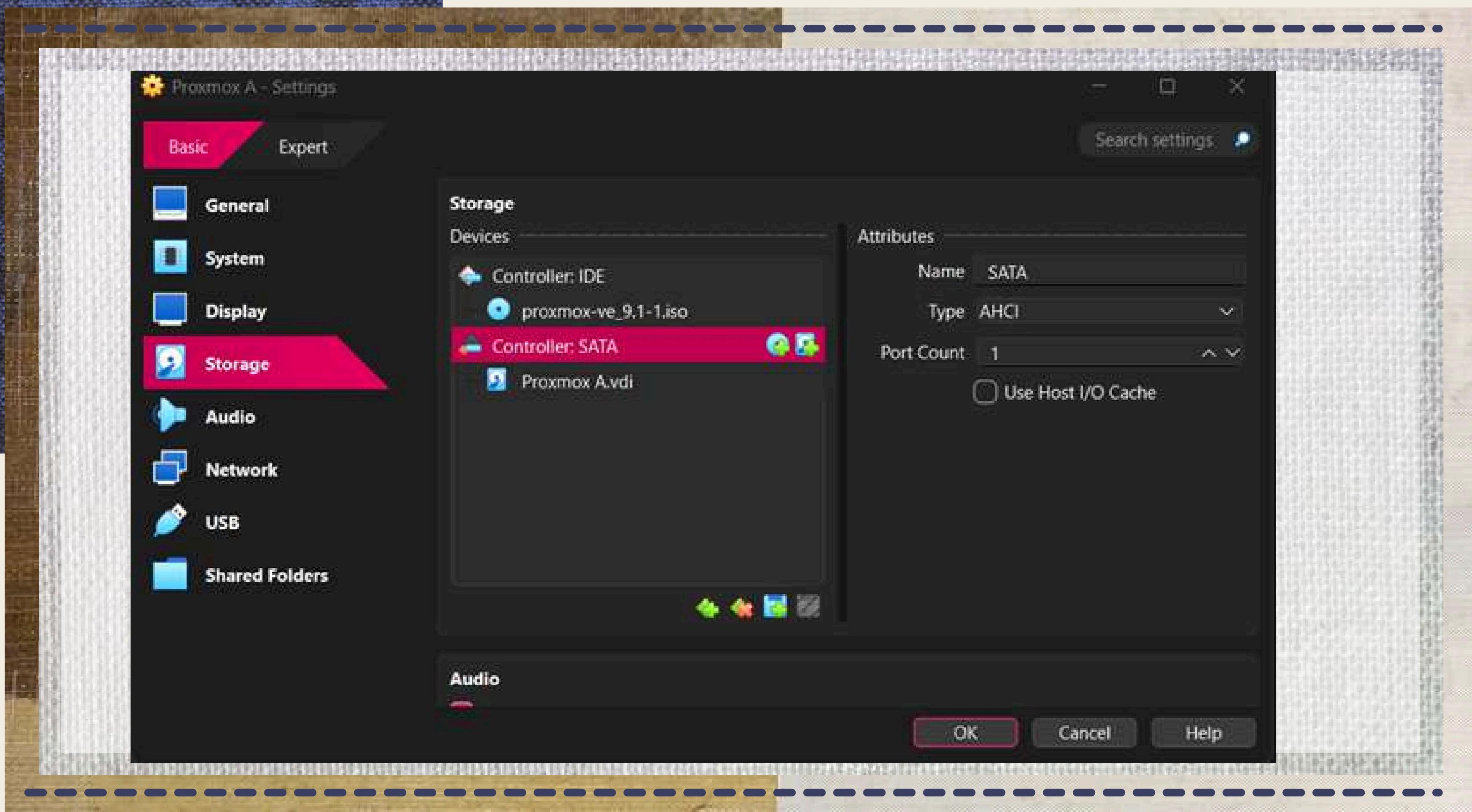
INSTALASI PROXMOX VE



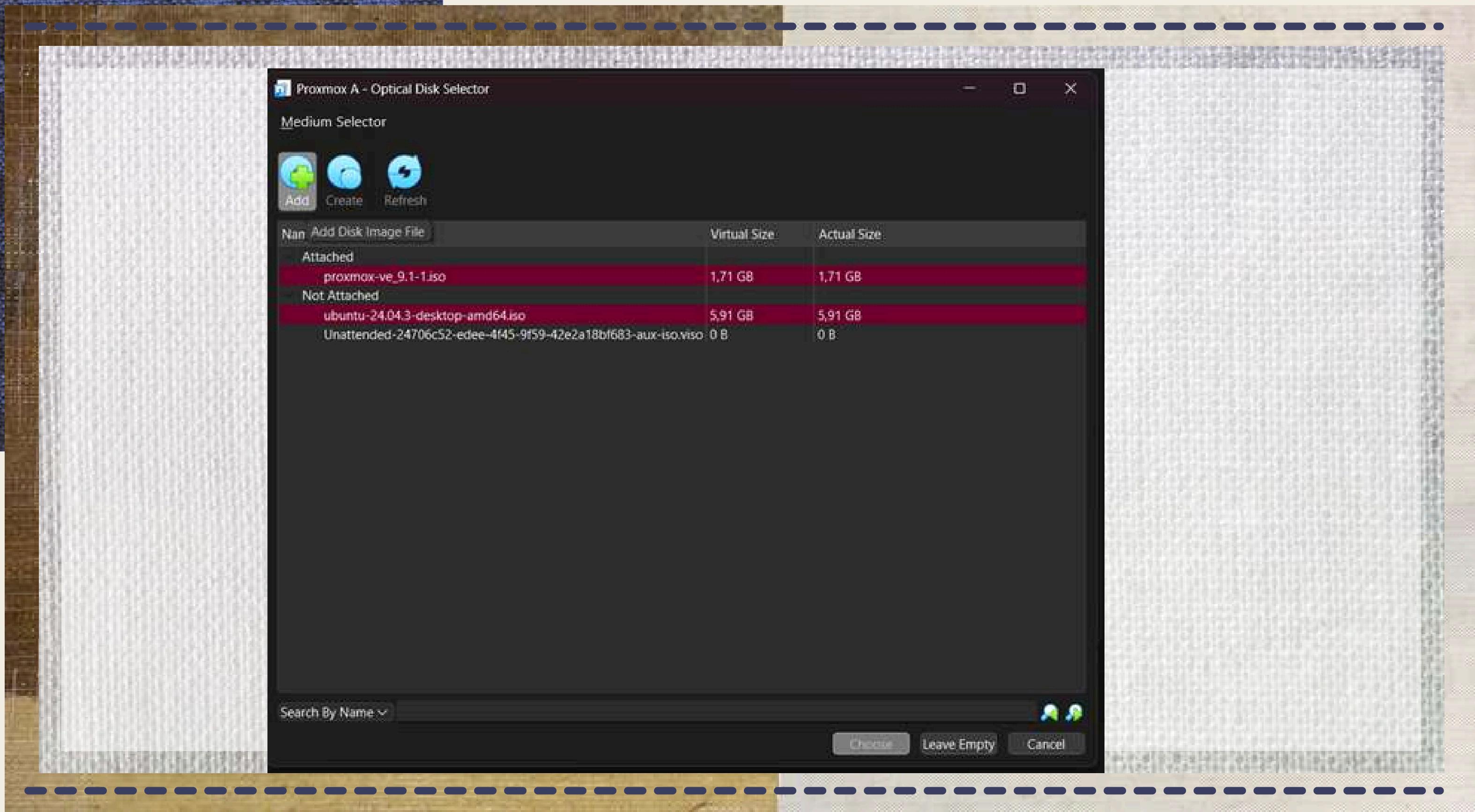
PENGATURAN ALOKASI CPU



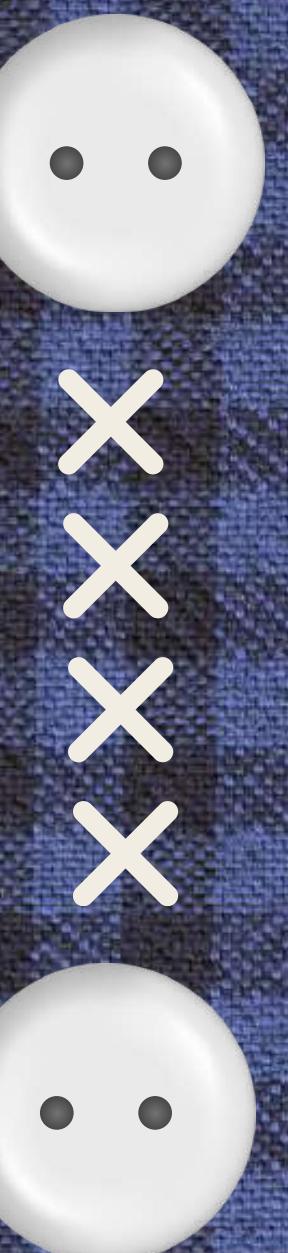
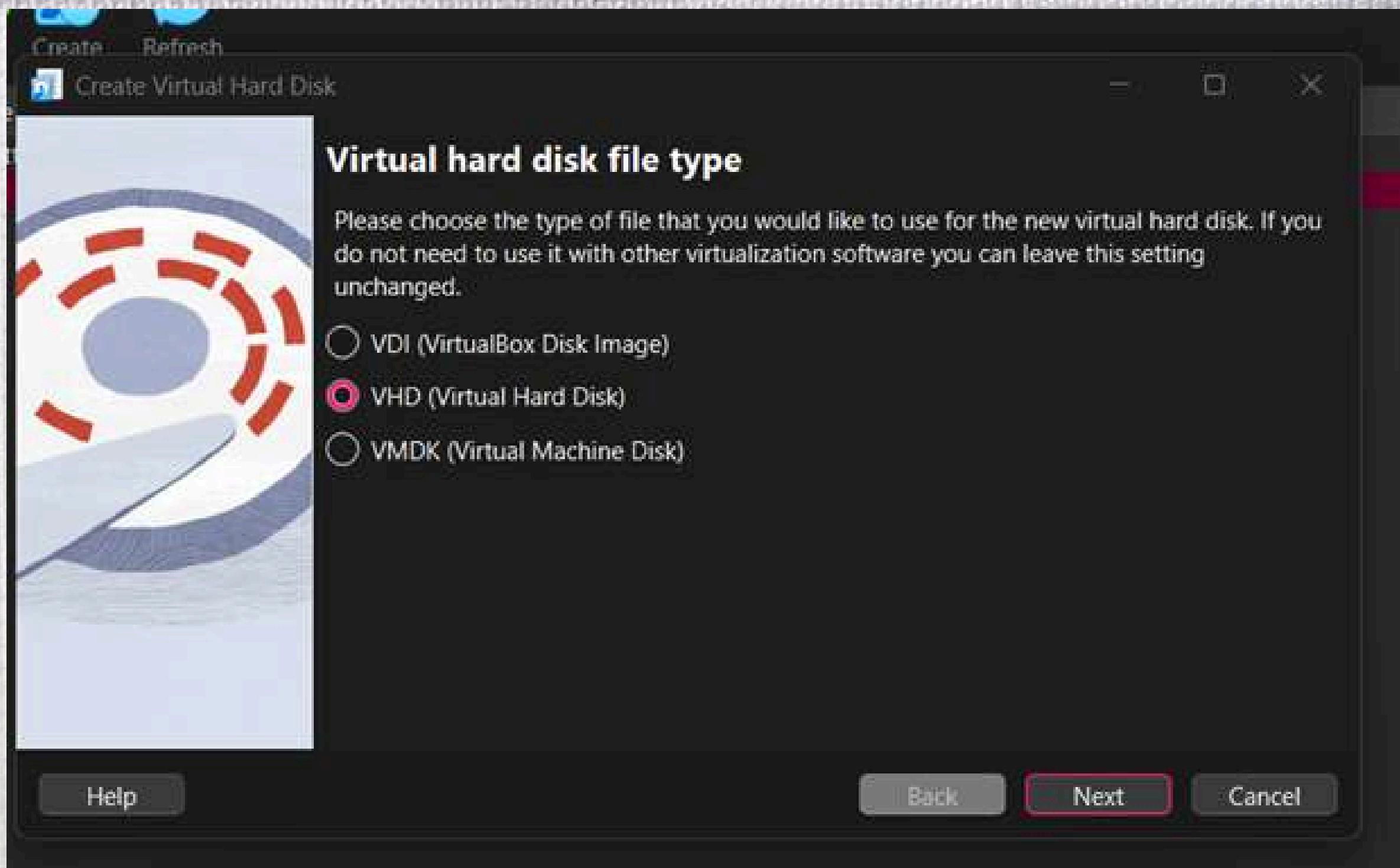
KONFIGURASI STORAGE PADA CONTROLLER SATA



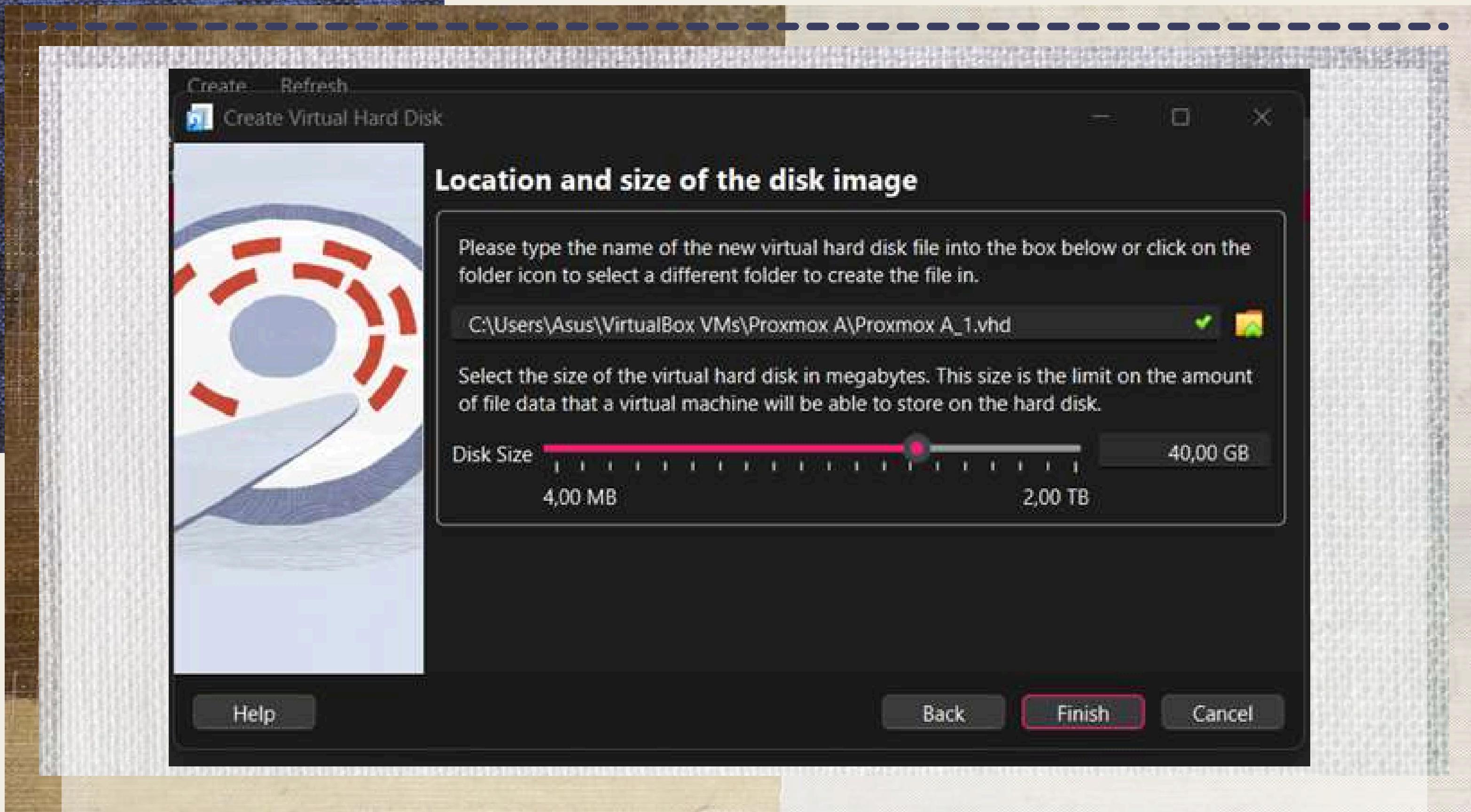
PENAMBAHAN MEDIA PENYIMPANAN VIRTUAL



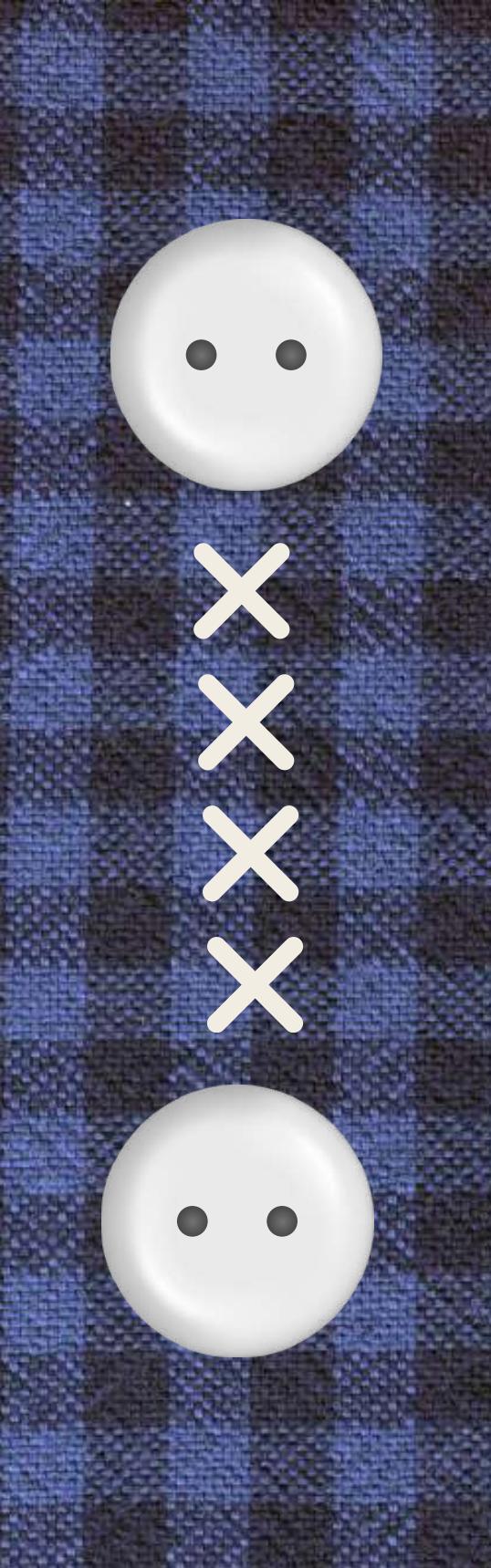
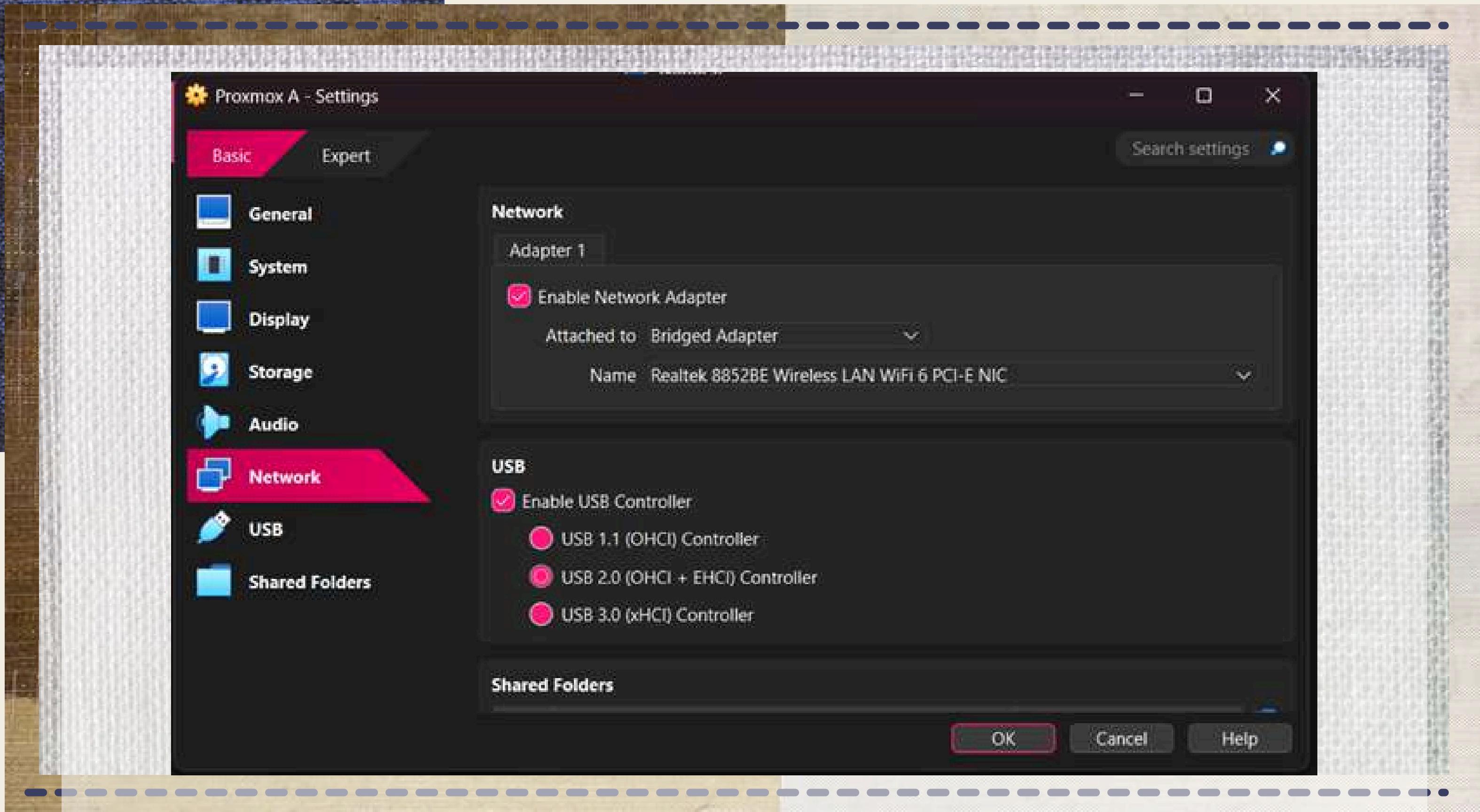
PEMILIHAN JENIS VIRTUAL HARD DISK SEBAGAI MEDIA MIGRASI



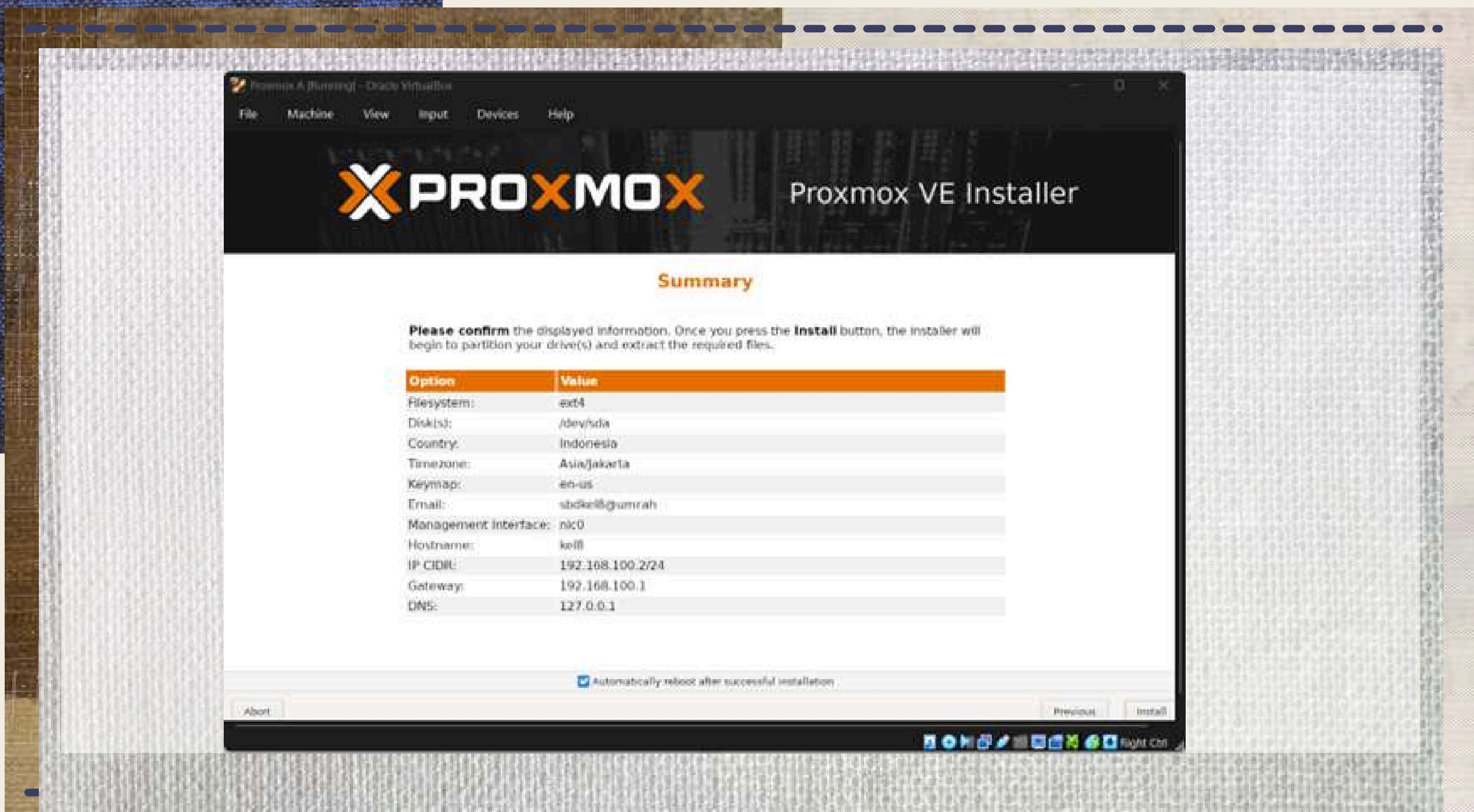
PENETAPAN KAPASiTAS STORAGE



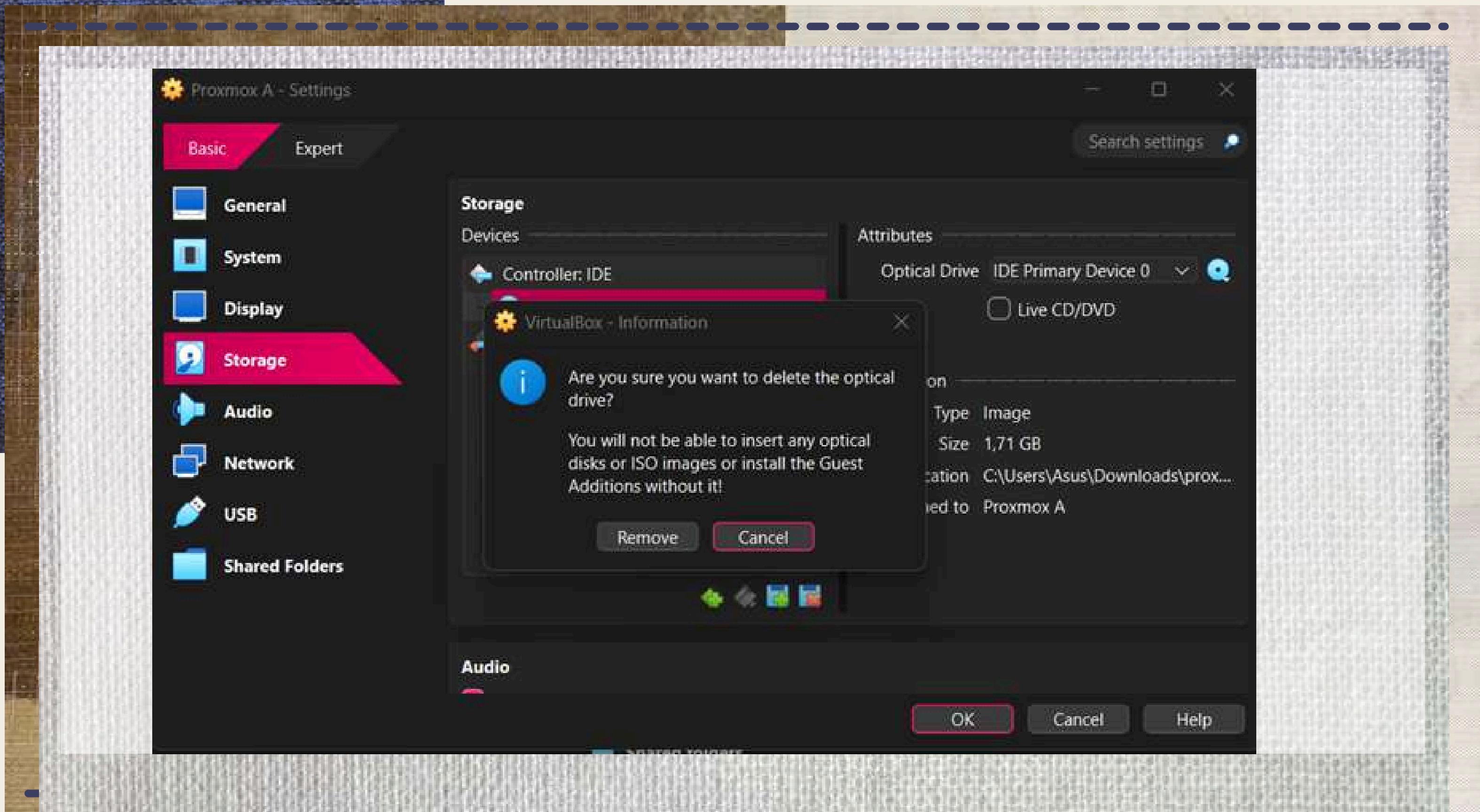
PENGATURAN BRIDGED ADAPTER PADA MESIN VIRTUAL



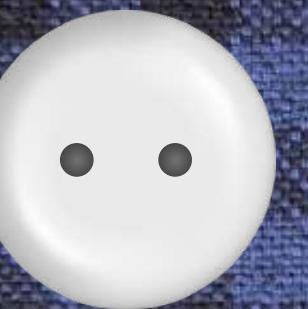
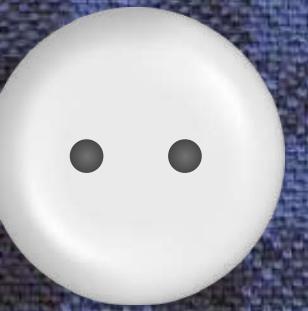
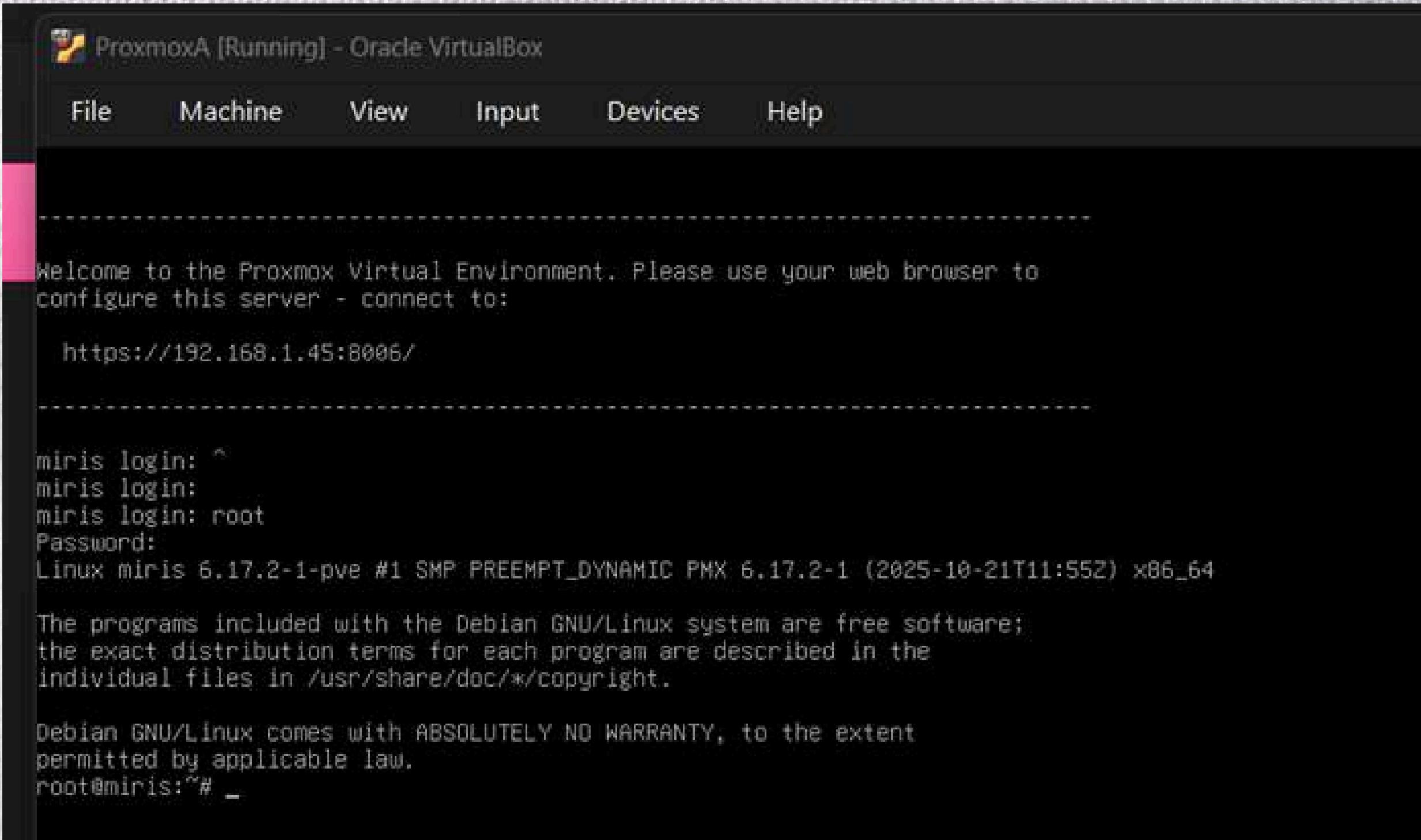
KONFIGURASI AWAL PROXMOX VE



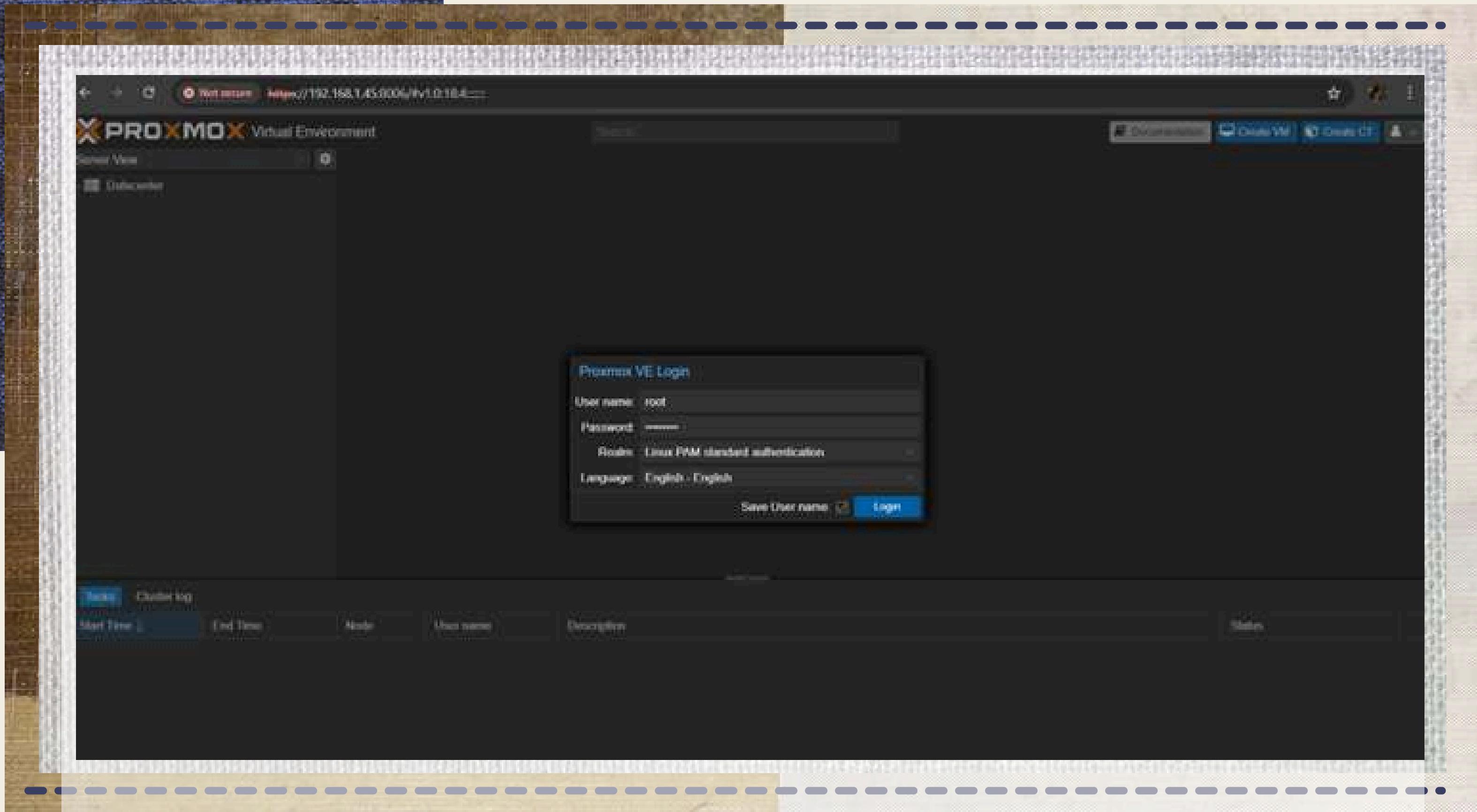
PENGHAPUSAN FILE ISO INSTALASI



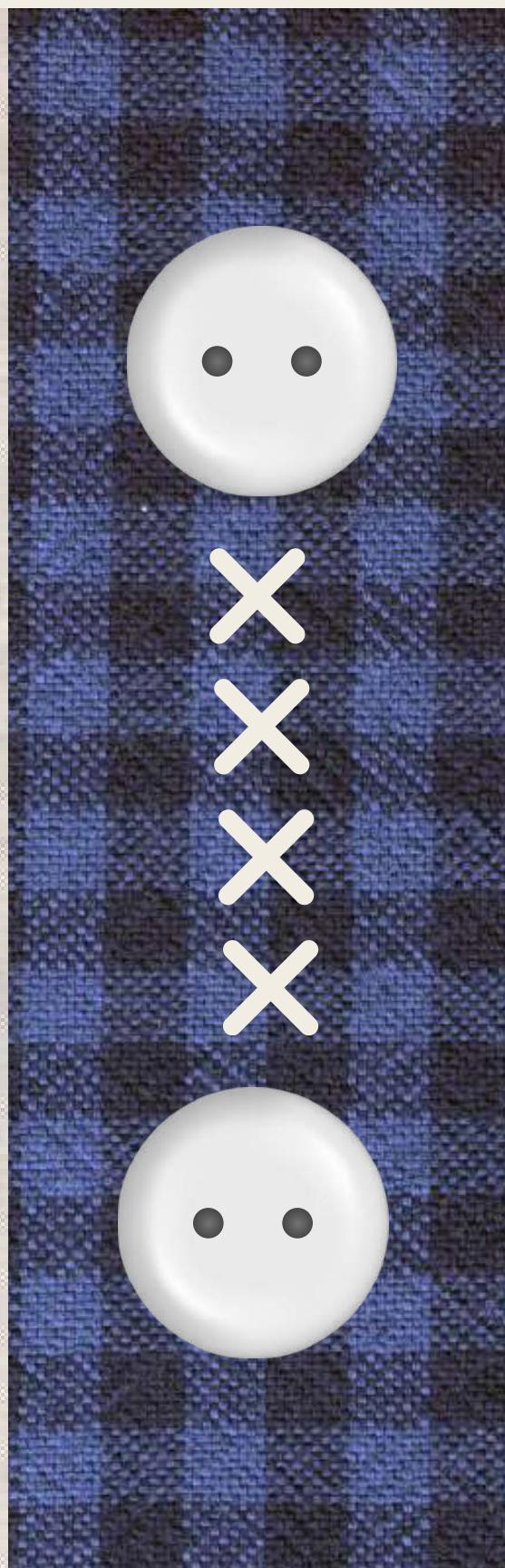
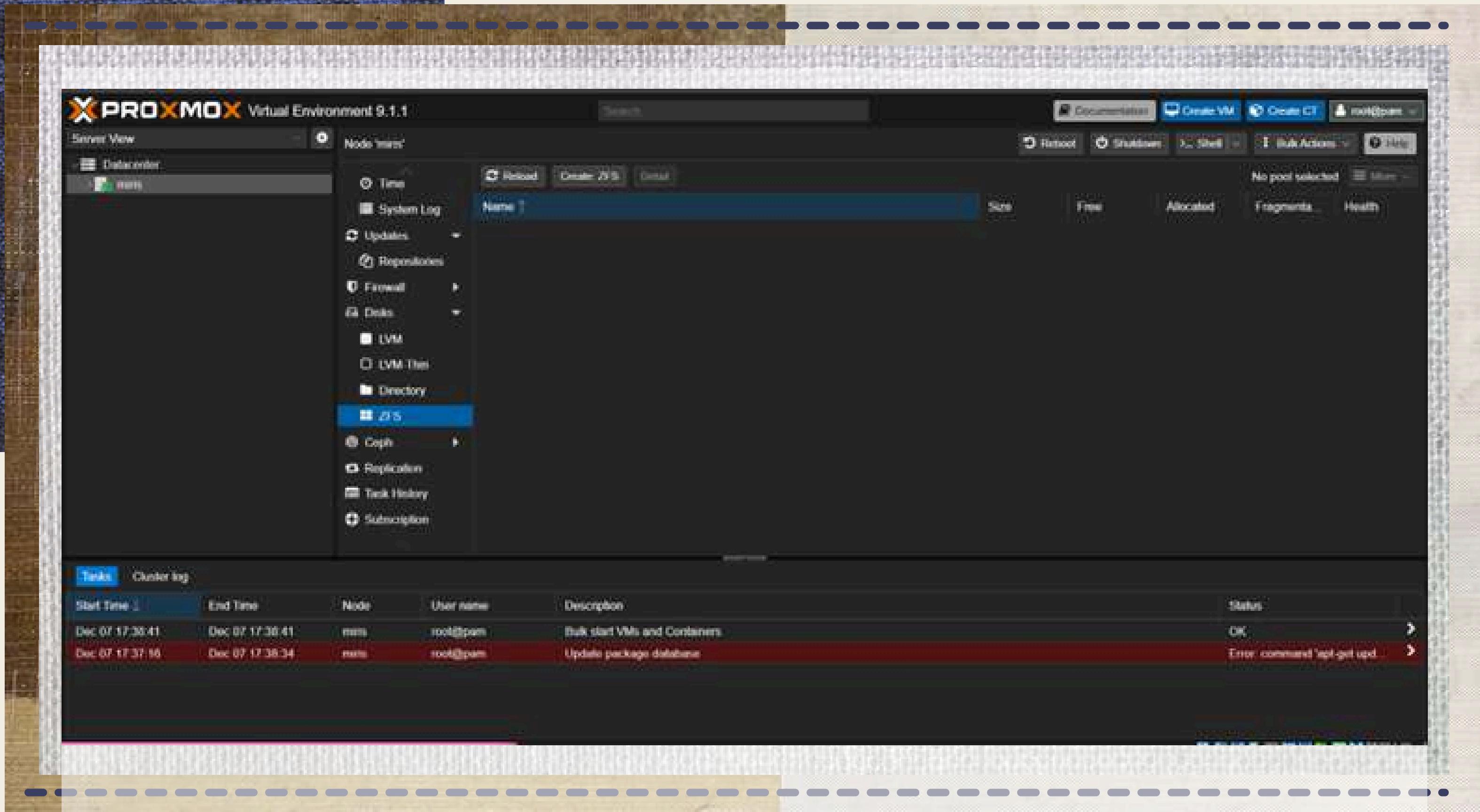
AKSES WEB INTERFACE PROXMOX VE



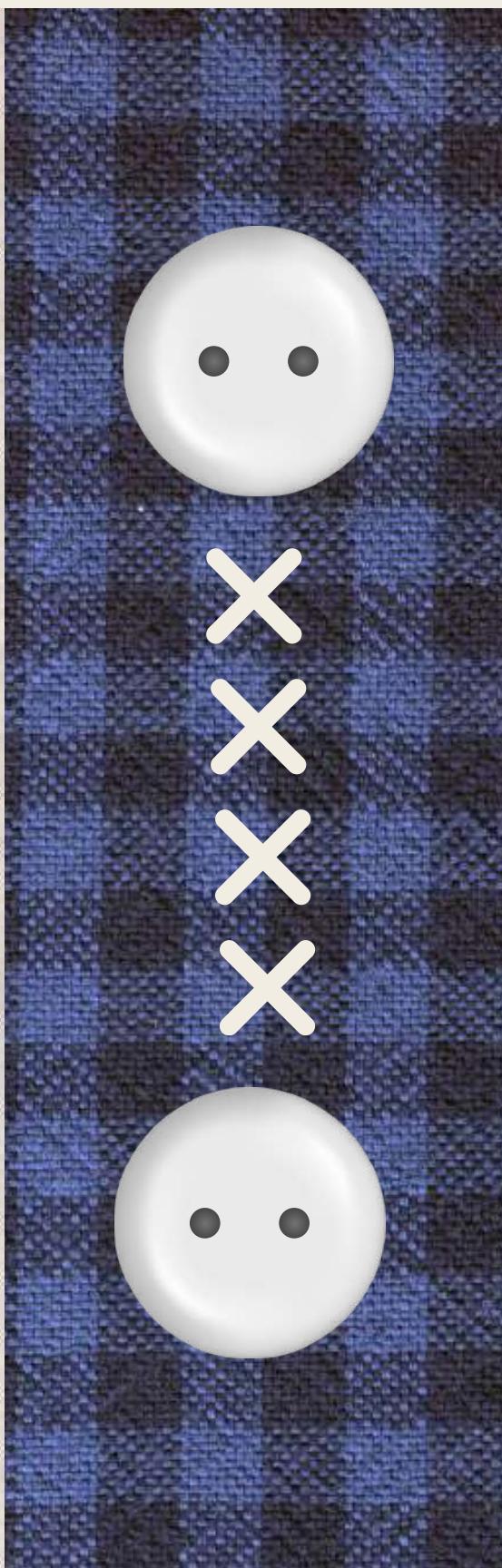
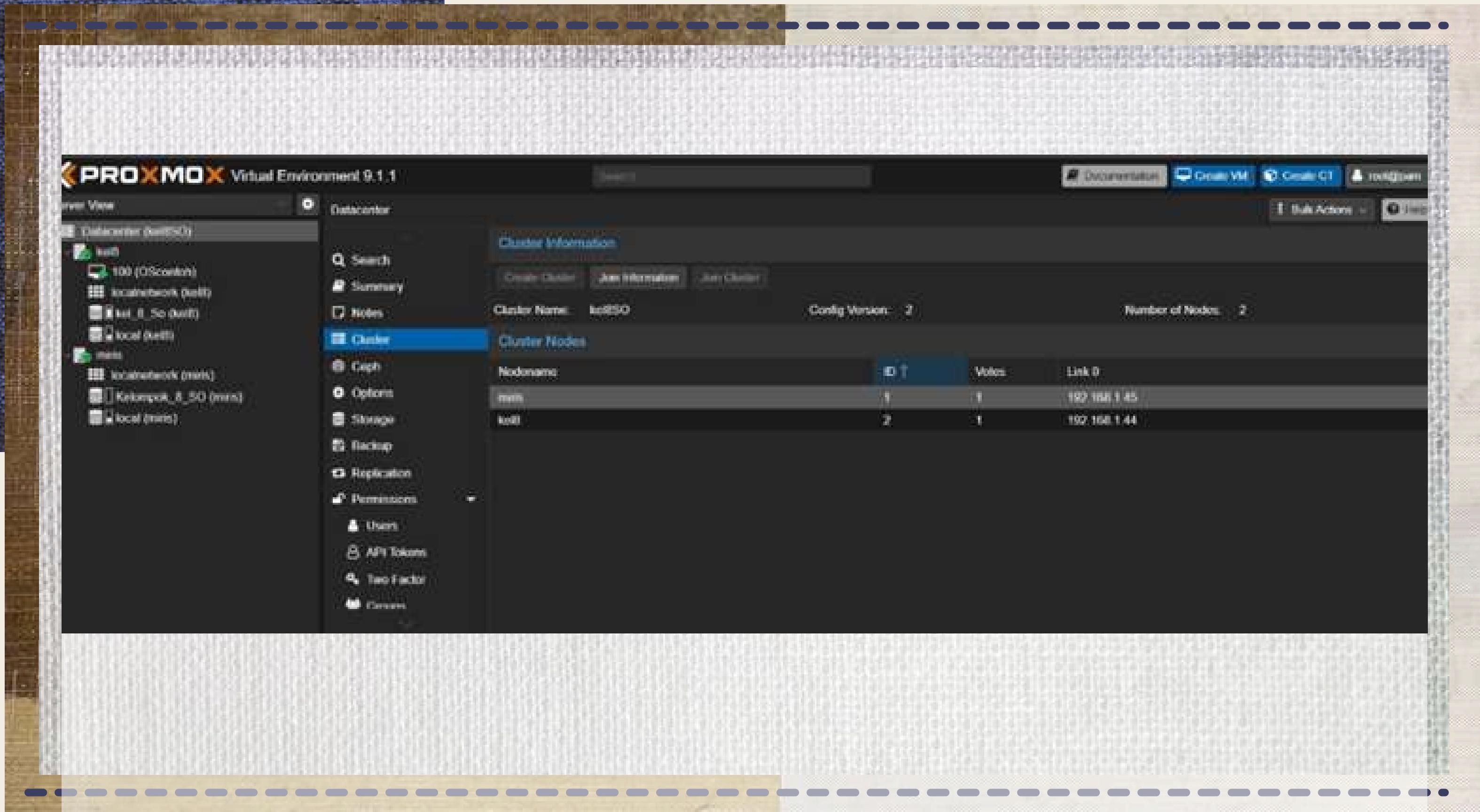
HALAMAN LOGIN ANTARMUKA WEB PROXMOX VE



KONFiGURASI ZFS STORAGE PADA PROXMOX VE



PROSES PEMBUATAN CLUSTER PADA NODE MIRIS



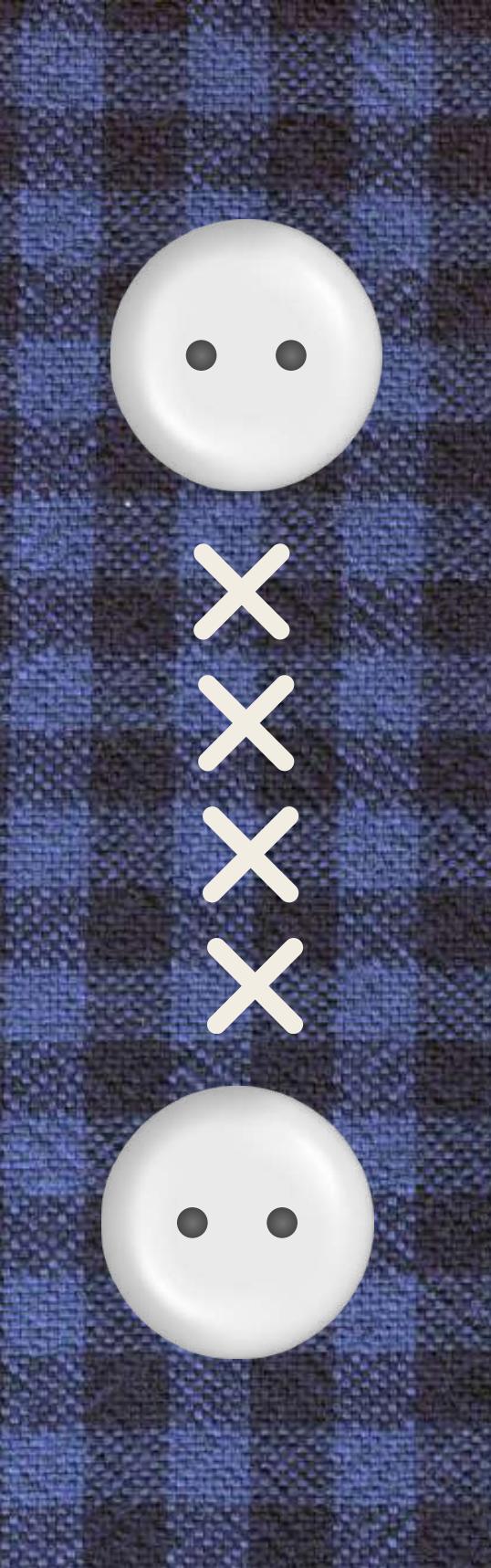
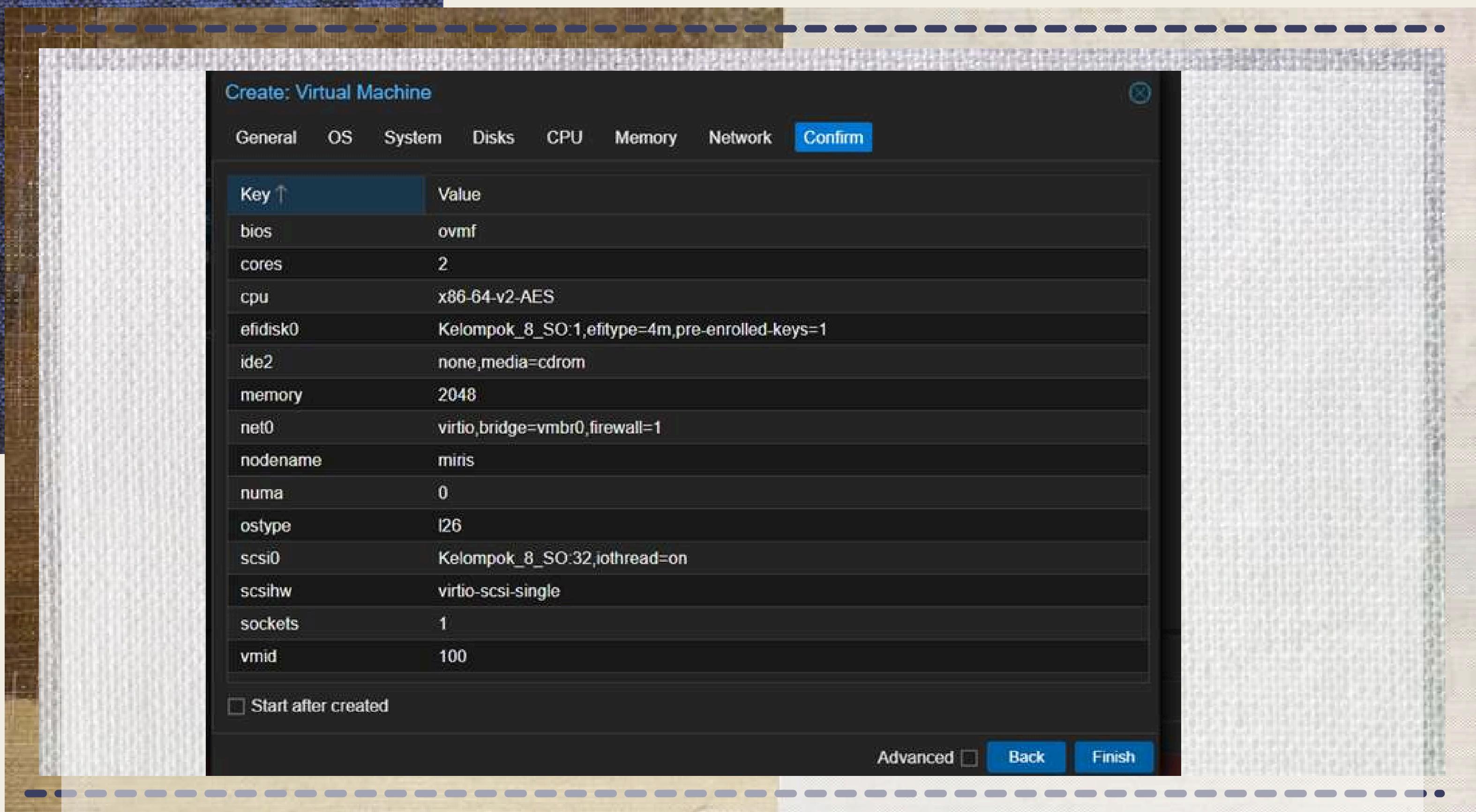
PROSES JOIN NODE KEL8 KE CLUSTER MIRIS

The screenshot shows the Proxmox VE 9.1.1 web interface. In the top navigation bar, there are tabs for 'Dashboard', 'Cluster', 'Compute', 'Storage', 'Network', and 'Logs'. The 'Cluster' tab is selected. On the left sidebar, under the 'Cluster' section, there is a 'Join Cluster' button. The main content area has a title 'Cluster Information' with buttons for 'Create Cluster', 'Join Cluster', and 'Join Miris'. Below this, it says 'Standalone node - No Cluster defined'. A modal window titled 'Cluster Join' is open, containing a note about pasted cluster join information and a password field with an error message 'This field is required'. The bottom part of the screen shows a table of logs:

Start Time	End Time	Node	User name	Description	Status
Dec 07 17:55:40	Dec 07 17:59:45	node8	root@proxmox	Join Cluster	Error: 401 authentication fail
Dec 07 17:59:54	Dec 07 17:59:54	node8	root@proxmox	Bulk start VMs and Containers	OK
Dec 07 17:59:57	Dec 07 17:59:58	node8	root@proxmox	Update package database	Error: command 'apt-get update'



PEMBUATAN VIRTUAL MACHINE SEBAGAI MEDIA MIGRASI



MENJALANKAN VM SEBELUM PROSES MIGRASI



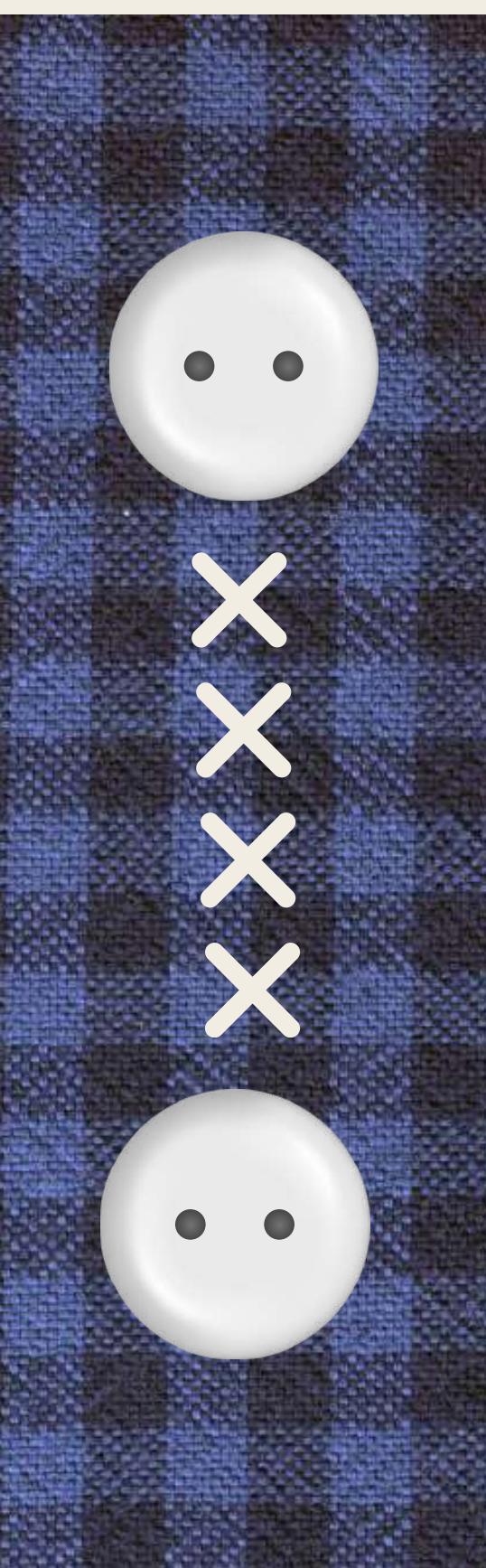
PROSES LIVE MIGRATION ANTAR-NODE

The screenshot shows the Proxmox Virtual Environment (VE) 9.1.1 web interface. The main title bar indicates the URL is <https://192.168.1.45:8006/#/v1.0/qemu%2f1004:pcmonolo:contentBackup-9-2>. The top navigation bar includes links for Documentation, Create VM, Create CI, and Logout. The left sidebar shows a tree view of Datacenter (Node01), including KVM and QEMU sections, and a section for VMs (mrr). The central panel displays a "Task viewer: VM 100 - Migrate (mrrl0 --> k0l0)" window. This window has tabs for Summary, Log, Output, and Status. The "Output" tab is selected and shows a log of the migration process. The log entries include:

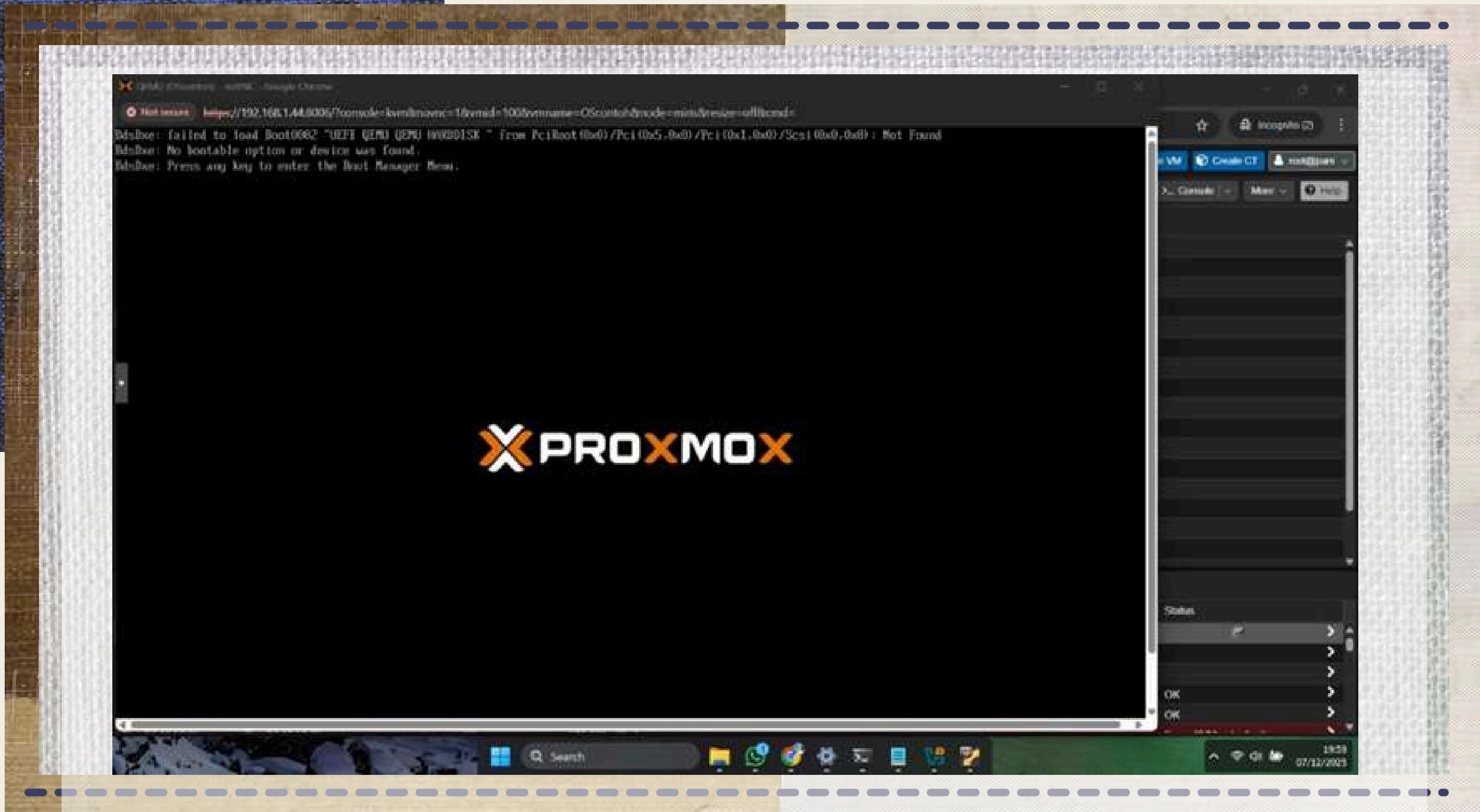
```
2020-12-07 19:56:35 [mrr] tunnel open
2020-12-07 19:56:45 starting storage migration
2020-12-07 19:56:45 start migration to redacted:qemu/service/100_migration/partition/drive/scsi0
drive: scsi0 is starting for slave scsi0
mirror: scsi0: transferred 69.0 MB of 32.0 GB (0.21%) in 3s
mirror: scsi0: transferred 134.0 MB of 32.0 GB (0.41%) in 2s
mirror: scsi0: transferred 207.0 MB of 32.0 GB (0.62%) in 2s
mirror: scsi0: transferred 280.0 MB of 32.0 GB (0.87%) in 4s
mirror: scsi0: transferred 347.0 MB of 32.0 GB (1.07%) in 5s
mirror: scsi0: transferred 414.0 MB of 32.0 GB (1.26%) in 6s
mirror: scsi0: transferred 481.0 MB of 32.0 GB (1.45%) in 7s
mirror: scsi0: transferred 548.0 MB of 32.0 GB (1.64%) in 8s
mirror: scsi0: transferred 615.0 MB of 32.0 GB (1.83%) in 9s
mirror: scsi0: transferred 682.0 MB of 32.0 GB (2.02%) in 10s
mirror: scsi0: transferred 749.0 MB of 32.0 GB (2.21%) in 11s
mirror: scsi0: transferred 816.0 MB of 32.0 GB (2.40%) in 12s
mirror: scsi0: transferred 883.0 MB of 32.0 GB (2.59%) in 13s
mirror: scsi0: transferred 950.0 MB of 32.0 GB (2.78%) in 14s
mirror: scsi0: transferred 1.1 GB of 32.0 GB (3.10%) in 15s
mirror: scsi0: transferred 1.4 GB of 32.0 GB (4.53%) in 12s
mirror: scsi0: transferred 1.5 GB of 32.0 GB (4.68%) in 12s
mirror: scsi0: transferred 1.7 GB of 32.0 GB (5.20%) in 12s
mirror: scsi0: transferred 1.9 GB of 32.0 GB (5.80%) in 14s
mirror: scsi0: transferred 2.0 GB of 32.0 GB (6.20%) in 15s
mirror: scsi0: transferred 2.3 GB of 32.0 GB (7.20%) in 18s
mirror: scsi0: transferred 2.7 GB of 32.0 GB (8.20%) in 20s
mirror: scsi0: transferred 2.8 GB of 32.0 GB (8.70%) in 20s
```

Below the task viewer, there is a "Tasks" table showing a list of recent tasks. The table includes columns for Start Time, End Time, Node, and Status. The tasks listed are:

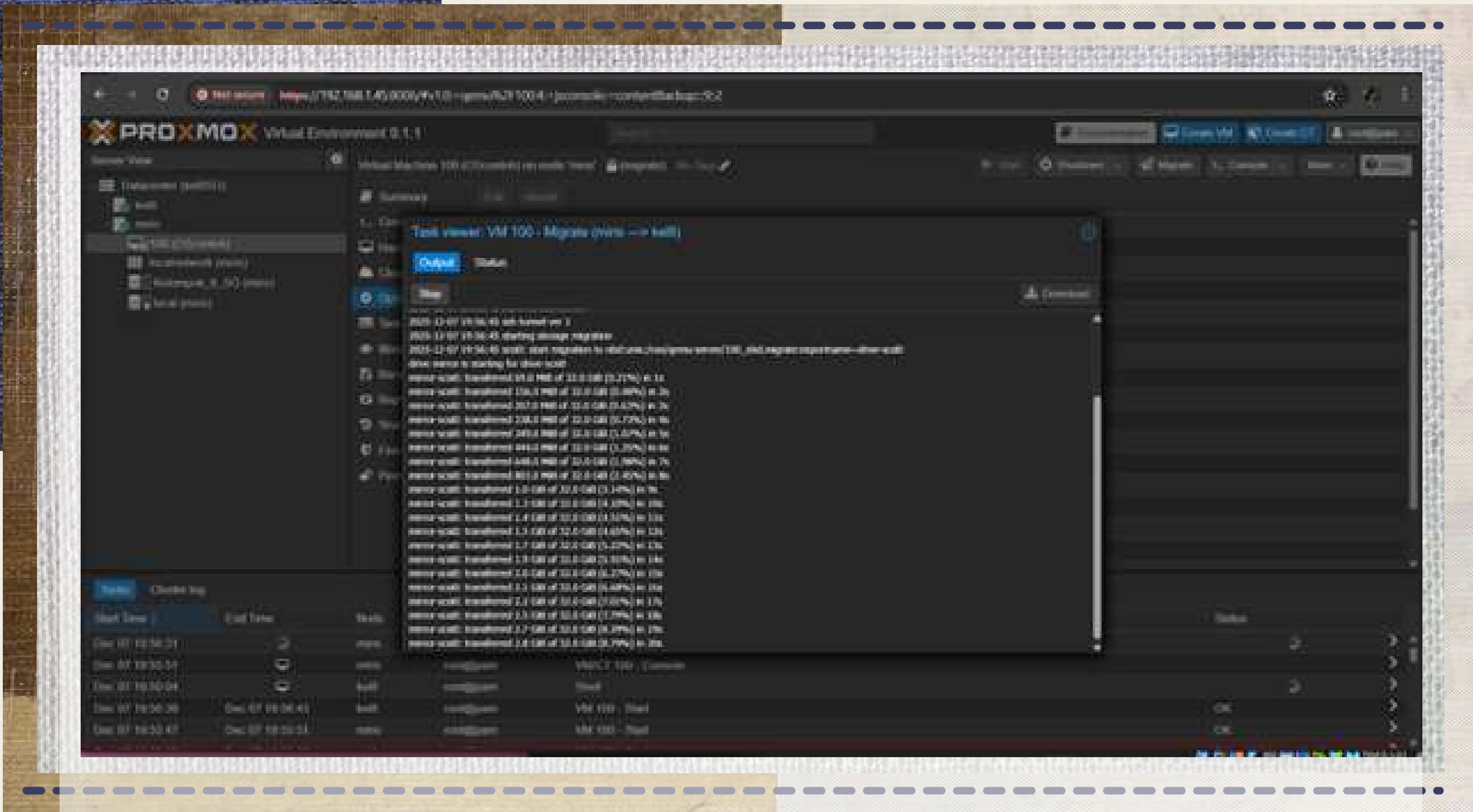
Start Time	End Time	Node	Status
Dec 07 19:56:31		mrrl0	vm-Migration
Dec 07 19:56:31		k0l0	vm-Migration
Dec 07 19:56:34		k0l0	Start
Dec 07 19:56:38	Dec 07 19:56:45	k0l0	vm-Migration
Dec 07 19:56:47	Dec 07 19:55:51	mrrl0	vm-Migration



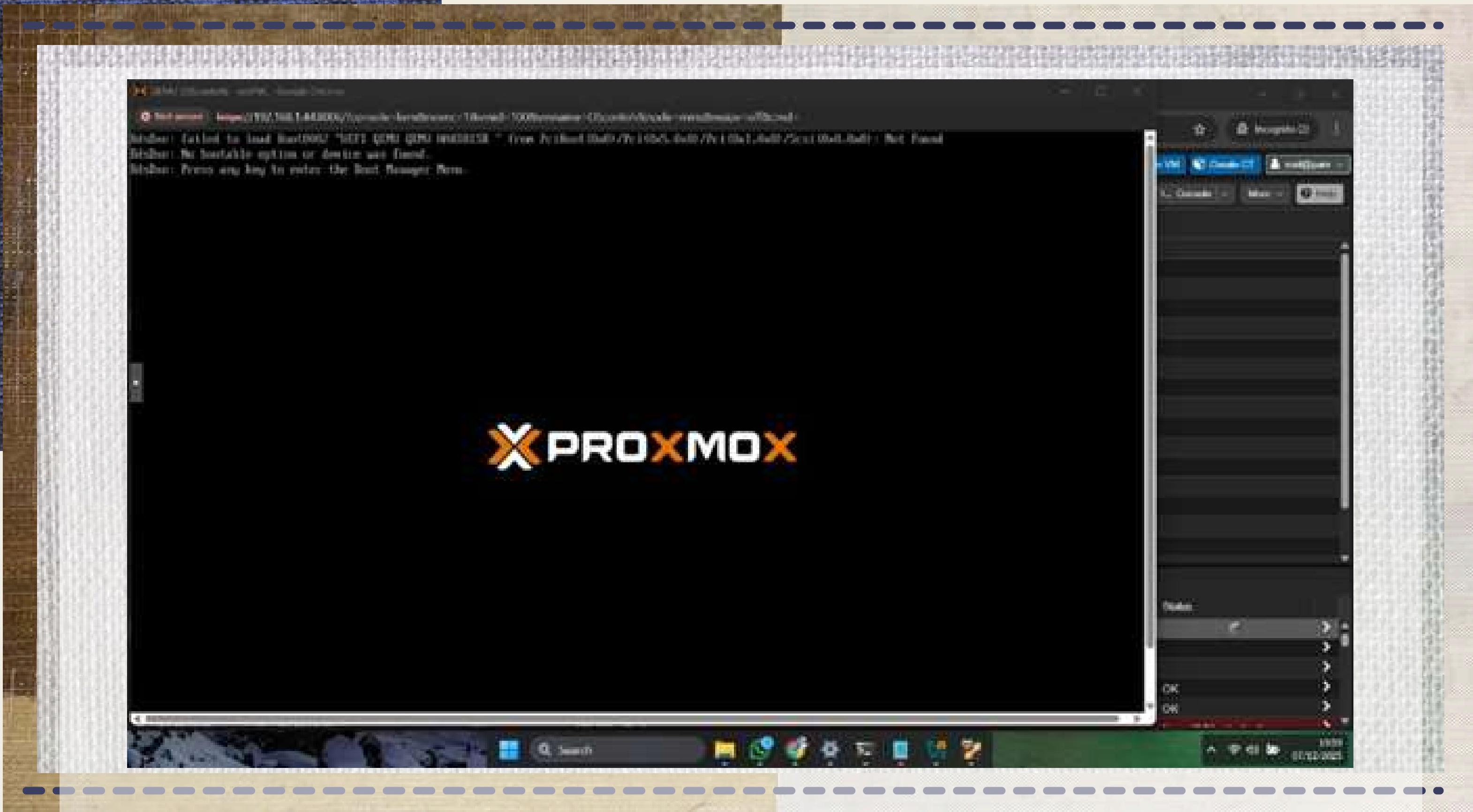
PROSES LIVE MIGRATION VM ANTAR-NODE PADA CLUSTER PROXMOX VE



PROSES MIGRATION



HASIL MIGRATION



ANALISIS HASIL

1. Live migration berjalan sukses
2. WiFi menyebabkan migrasi sedikit lebih lambat
3. Kendala storage dan KVM virtualization berhasil diatasi
4. Sistem tetap stabil setelah perbaikan konfigurasi

KESIMPULAN

Proyek implementasi cluster Proxmox VE berhasil dilakukan melalui tahapan instalasi node, konfigurasi jaringan, pembuatan cluster, serta pengujian fitur live migration. Hasil pengujian menunjukkan bahwa virtual machine dapat berpindah antar-node tanpa menghentikan layanan, meskipun menggunakan jaringan WiFi yang menyebabkan waktu migrasi sedikit lebih lama dibandingkan jaringan LAN. Secara keseluruhan, sistem cluster berjalan stabil dan mampu memberikan gambaran nyata mengenai penerapan shared storage, live migration, dan high availability pada Proxmox VE, sehingga tujuan proyek dapat tercapai dengan baik.



**TERIMA
KASIH**