IMPLEMENTATION OF VIRTUAL MACHINES

Title

Implementation of Different Types of Virtual Machines

Aim

To create and execute **desktop virtual machines**, **server virtual machines**, and **cloud virtual machines** using virtualization technologies and to understand their working and use cases.

Software Requirements

- **Host Operating System**: Kali Linux
- **Virtualization Tools**: KVM / QEMU with Virtual Machine Manager (virt-manager)
- **Cloud Platform**: AWS EC2
- **Guest Operating Systems**:
    - Ubuntu Desktop 24.04 LTS
    - Ubuntu Server 22.04 LTS

Virtual Machine:

A **Virtual Machine (VM)** is a software-based computer that runs a **complete operating system** with its own kernel, memory, CPU, and storage.

Virtual machines provide:

- Strong isolation
- Better security
- Support for different OS types

Unlike containers, VMs use a **hypervisor** to emulate hardware.

Method 1: Desktop Virtual Machine

Description

A **desktop virtual machine** provides a **graphical user interface (GUI)** similar to a physical computer.

- **Guest OS**: Ubuntu Desktop 24.04 LTS
- **Tool Used**: KVM / QEMU (virt-manager)
- **VM Type**: Desktop VM (GUI-based)

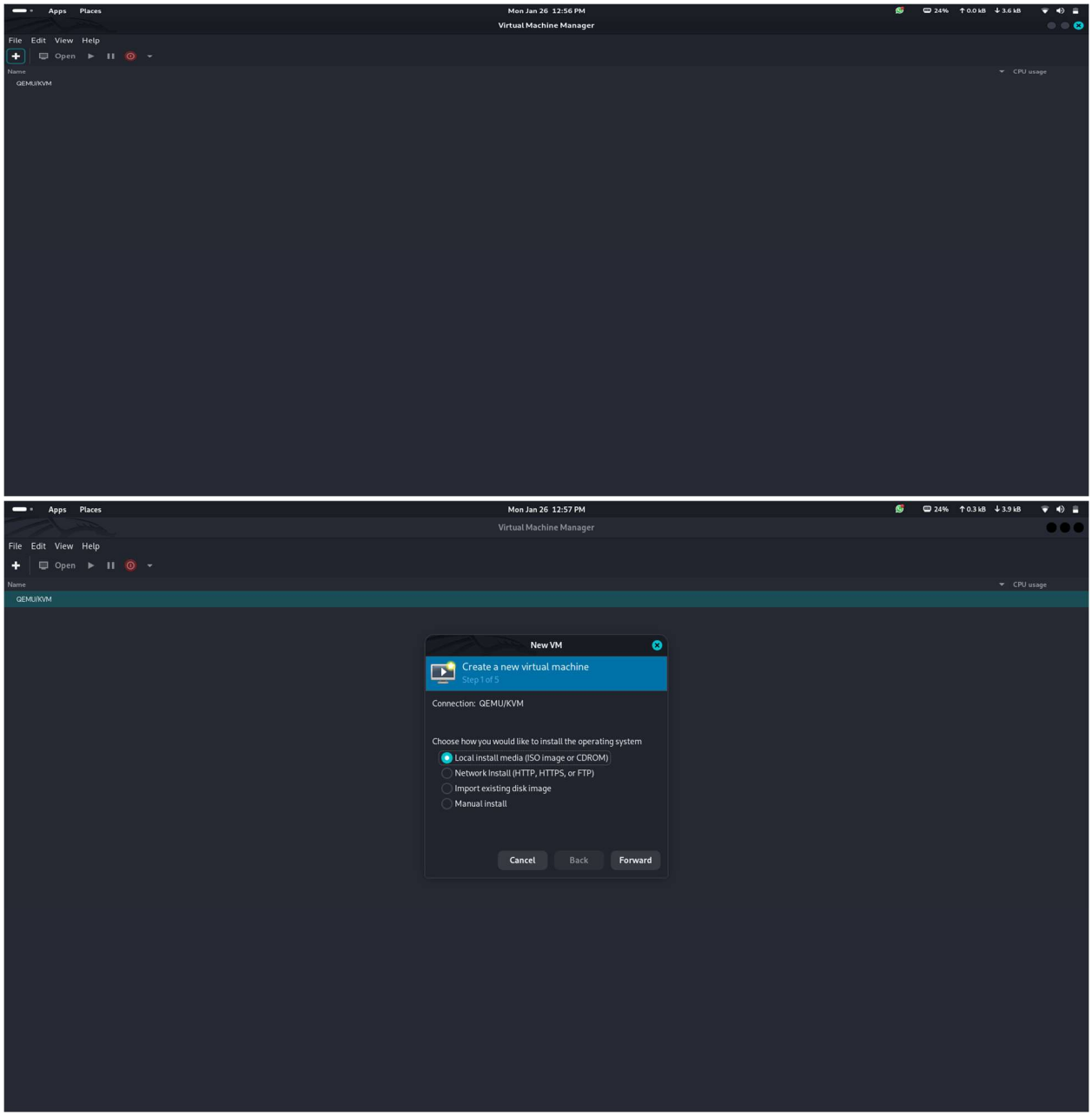
Procedure

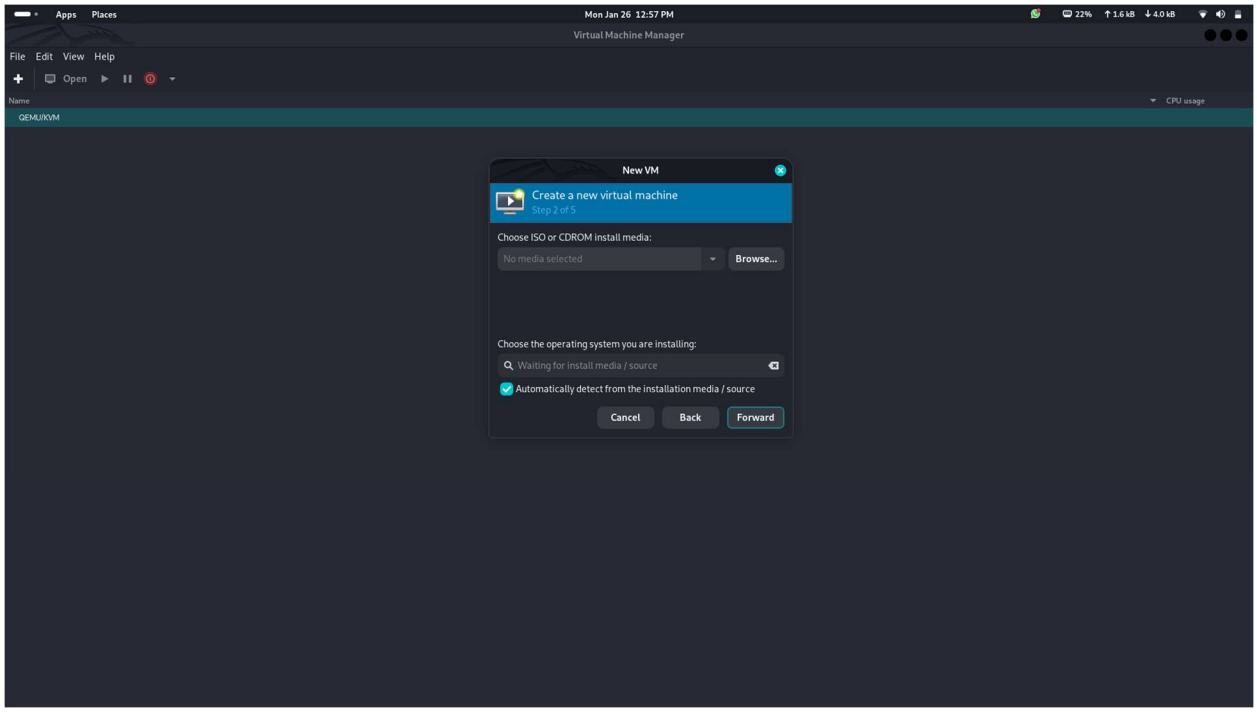
1. Open **Virtual Machine Manager (virt-manager)**.
2. Click **Create a new virtual machine**.
3. Select **Local install media (ISO image)**.
4. Browse and select **Ubuntu Desktop 24.04 ISO**.
5. Allocate system resources:
    a. CPU cores
    b. RAM
    c. Storage space
6. Configure network (default NAT).
7. Start the VM and begin installation.
8. Follow Ubuntu installer steps and complete OS installation.
9. Restart VM after installation.

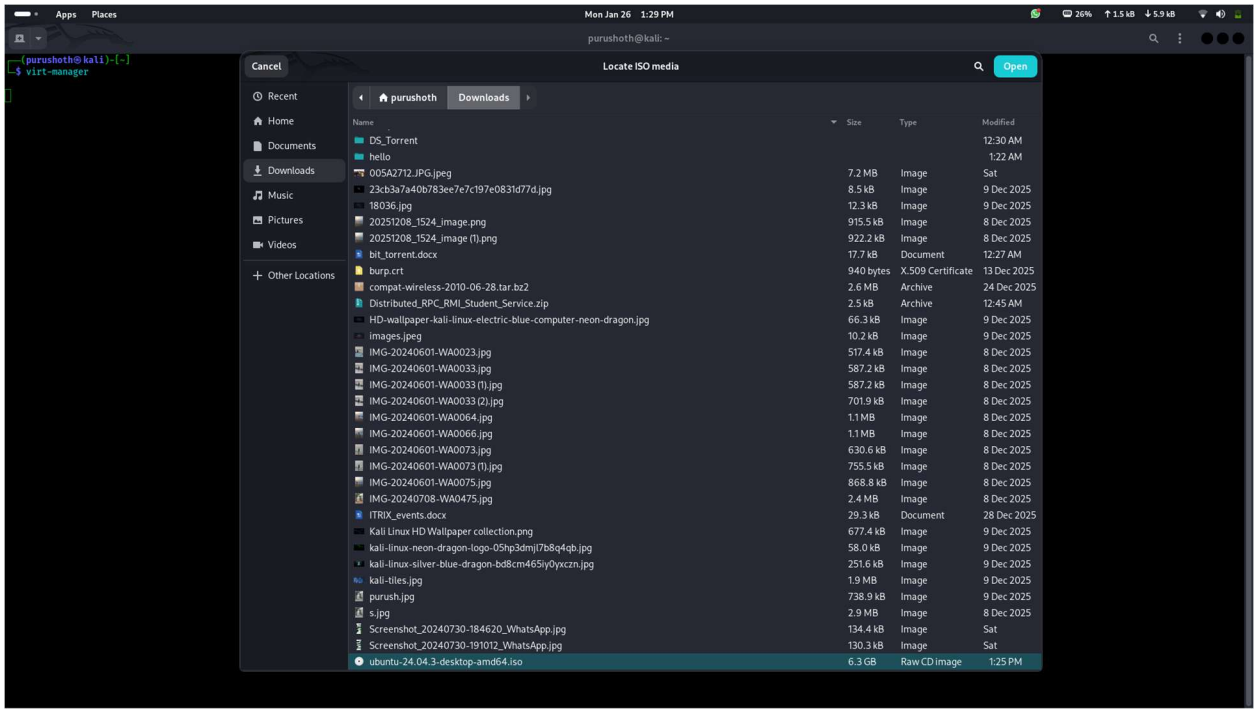
Observation

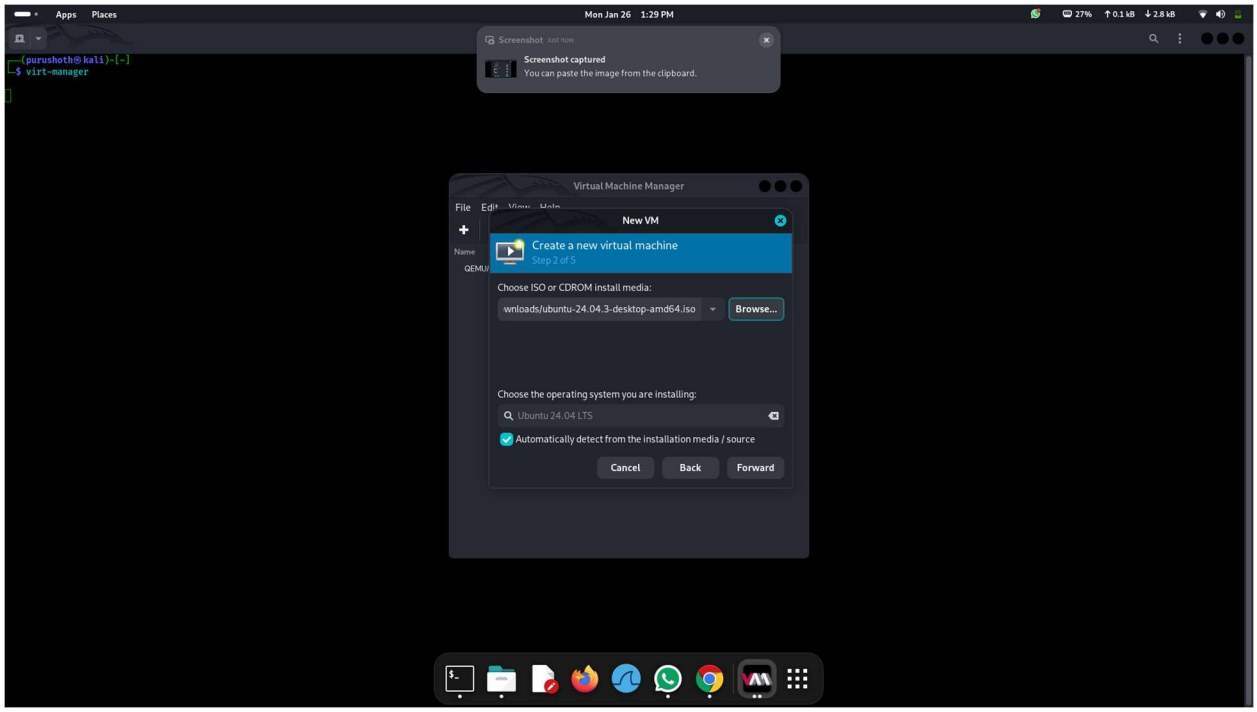
- Ubuntu Desktop GUI loaded successfully.
- Mouse, keyboard, and display worked properly inside VM.

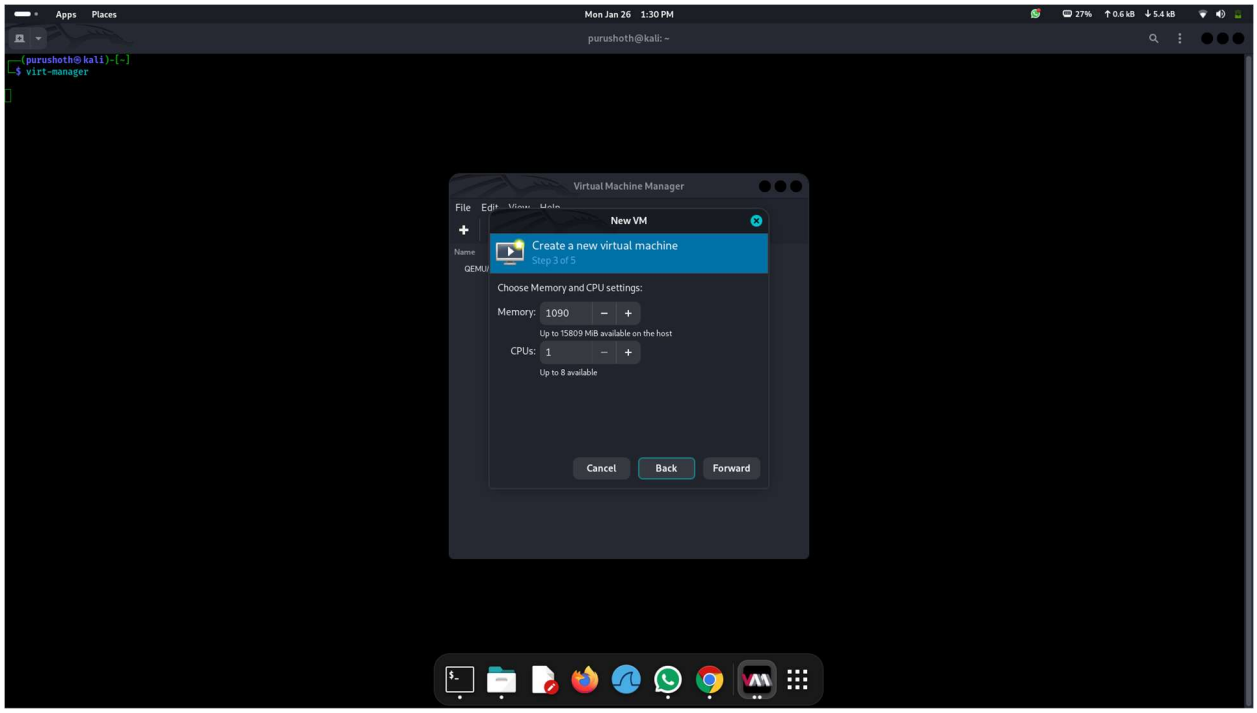
Screenshot–1: virt-manager showing Desktop VM

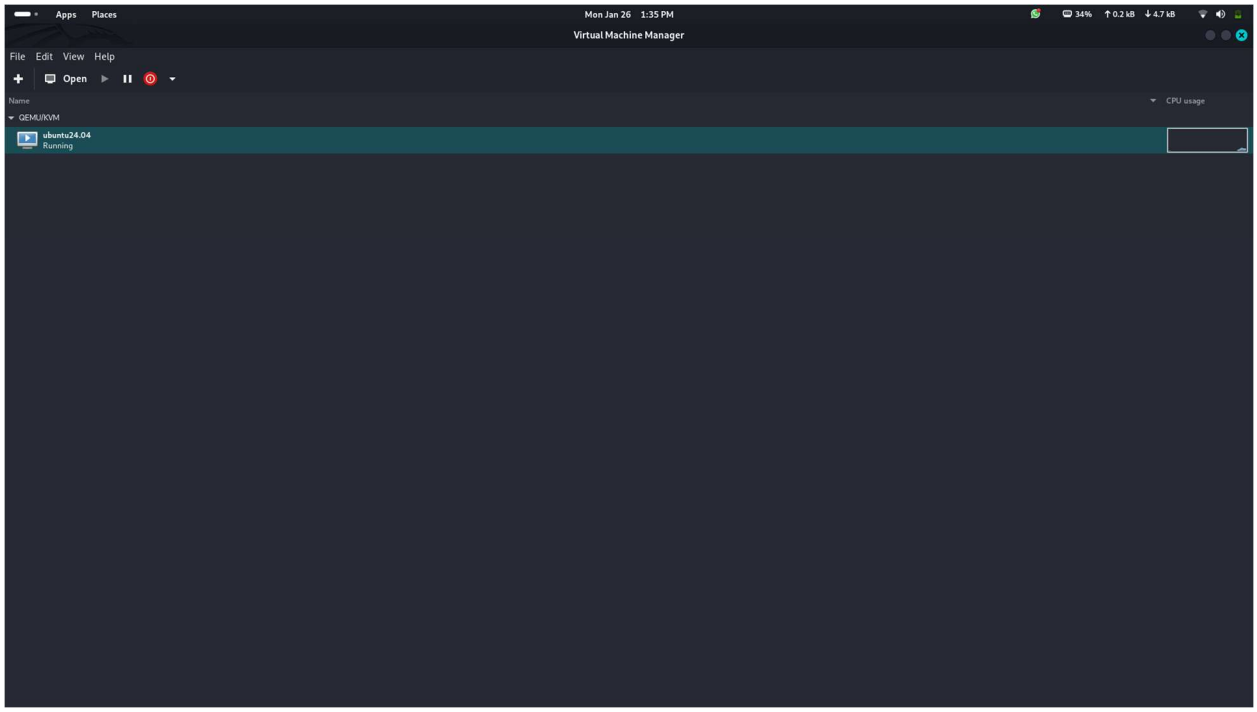


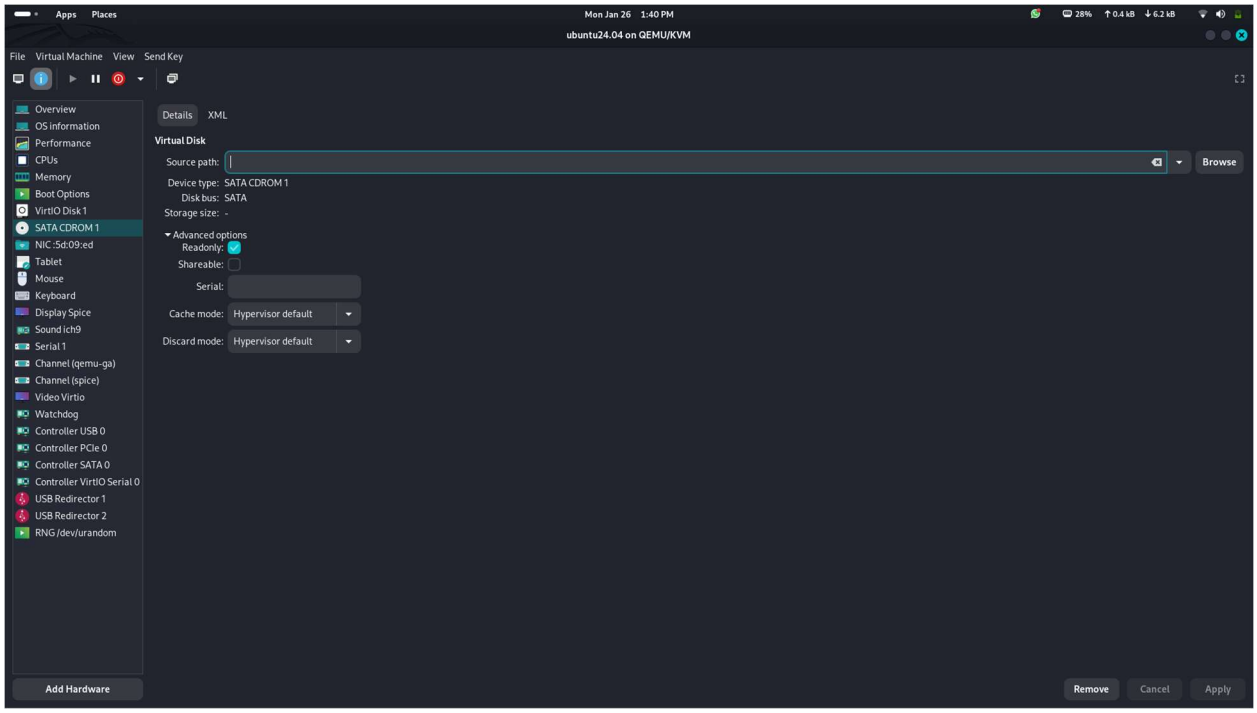

Apps
Places
Mon Jan 26 12:57 PM
22%
1.6 kB
4.0 kB
Virtual Machine Manager
File Edit View Help
Open
Name
CPU usage
QEMU/KVM
New VM
Create a new virtual machine
Step 2 of 5
Choose ISO or CDROM install media:
No media selected
Browse...
Choose the operating system you are installing:
Waiting for install media / source
Automatically detect from the installation media / source
Cancel
Back
Forward


Apps
Places
Mon Jan 26 1:29 PM
26%
1.5 kB
5.9 kB
purushoth@kali: ~
┌──(purushoth㉿kali)-[~]
└─$ virt-manager
Cancel
Locate ISO media
Open
Recent
Home
Documents
Downloads
Music
Pictures
Videos
Other Locations
purushoth
Downloads
Name
Size
Type
Modified
DS_Torrent 12:30 AM
hello 1:22 AM
005A2712.JPG.jpeg 7.2 MB Image Sat
23cb3a7a40b783ee7e7c197e0831d77d.jpg 8.5 kB Image 9 Dec 2025
18036.jpg 12.3 kB Image 9 Dec 2025
20251208_1524_image.png 915.5 kB Image 8 Dec 2025
20251208_1524_image (1).png 922.2 kB Image 8 Dec 2025
bit_torrent.docx 17.7 kB Document 12:27 AM
burp.crt 940 bytes X.509 Certificate 13 Dec 2025
compat-wireless-2010-06-28.tar.bz2 2.6 MB Archive 24 Dec 2025
Distributed_RPC_RMI_Student_Service.zip 2.5 kB Archive 12:45 AM
HD-wallpaper-kali-linux-electric-blue-computer-neon-dragon.jpg 66.3 kB Image 9 Dec 2025
images.jpeg 10.2 kB Image 9 Dec 2025
IMG-20240601-WA0023.jpg 517.4 kB Image 8 Dec 2025
IMG-20240601-WA0033.jpg 587.2 kB Image 8 Dec 2025
IMG-20240601-WA0033 (1).jpg 587.2 kB Image 8 Dec 2025
IMG-20240601-WA0033 (2).jpg 701.9 kB Image 8 Dec 2025
IMG-20240601-WA0064.jpg 1.1 MB Image 8 Dec 2025
IMG-20240601-WA0066.jpg 1.1 MB Image 8 Dec 2025
IMG-20240601-WA0073.jpg 630.6 kB Image 8 Dec 2025
IMG-20240601-WA0073 (1).jpg 755.5 kB Image 8 Dec 2025
IMG-20240601-WA0075.jpg 868.8 kB Image 8 Dec 2025
IMG-20240708-WA0475.jpg 2.4 MB Image 8 Dec 2025
ITRIX_events.docx 29.3 kB Document 28 Dec 2025
Kali Linux HD Wallpaper collection.png 677.4 kB Image 9 Dec 2025
kali-linux-neon-dragon-logo-05hp3dmji7b8q4qb.jpg 58.0 kB Image 9 Dec 2025
kali-linux-silver-blue-dragon-bd8cm465iy0yxczn.jpg 251.6 kB Image 9 Dec 2025
kali-tiles.jpg 1.9 MB Image 9 Dec 2025
purush.jpg 738.9 kB Image 9 Dec 2025
s.jpg 2.9 MB Image 8 Dec 2025
Screenshot_20240730-184620_WhatsApp.jpg 134.4 kB Image Sat
Screenshot_20240730-191012_WhatsApp.jpg 130.3 kB Image Sat
ubuntu-24.04.3-desktop-amd64.iso 6.3 GB Raw CD image 1:25 PM

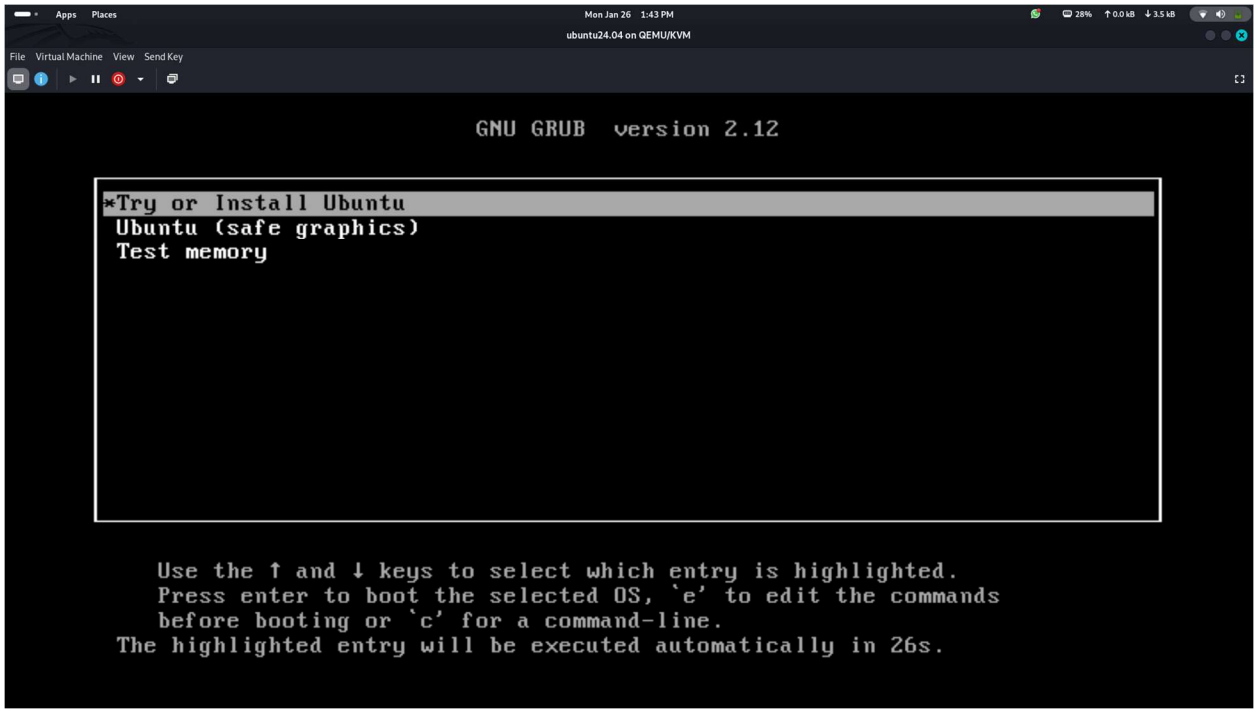

Apps
Places
Mon Jan 26 1:29 PM
27%
0.1 kB
2.8 kB
Screenshot Just now
Screenshot captured
You can paste the image from the clipboard.
┌──(purushoth㉿kali)-[~]
└─$ virt-manager
Virtual Machine Manager
File Edit View Help
Name
QEMU/
New VM
Create a new virtual machine
Step 2 of 5
Choose ISO or CDROM install media:
wnloads/ubuntu-24.04.3-desktop-amd64.iso
Browse...
Choose the operating system you are installing:
Ubuntu 24.04 LTS
Automatically detect from the installation media / source
Cancel
Back
Forward

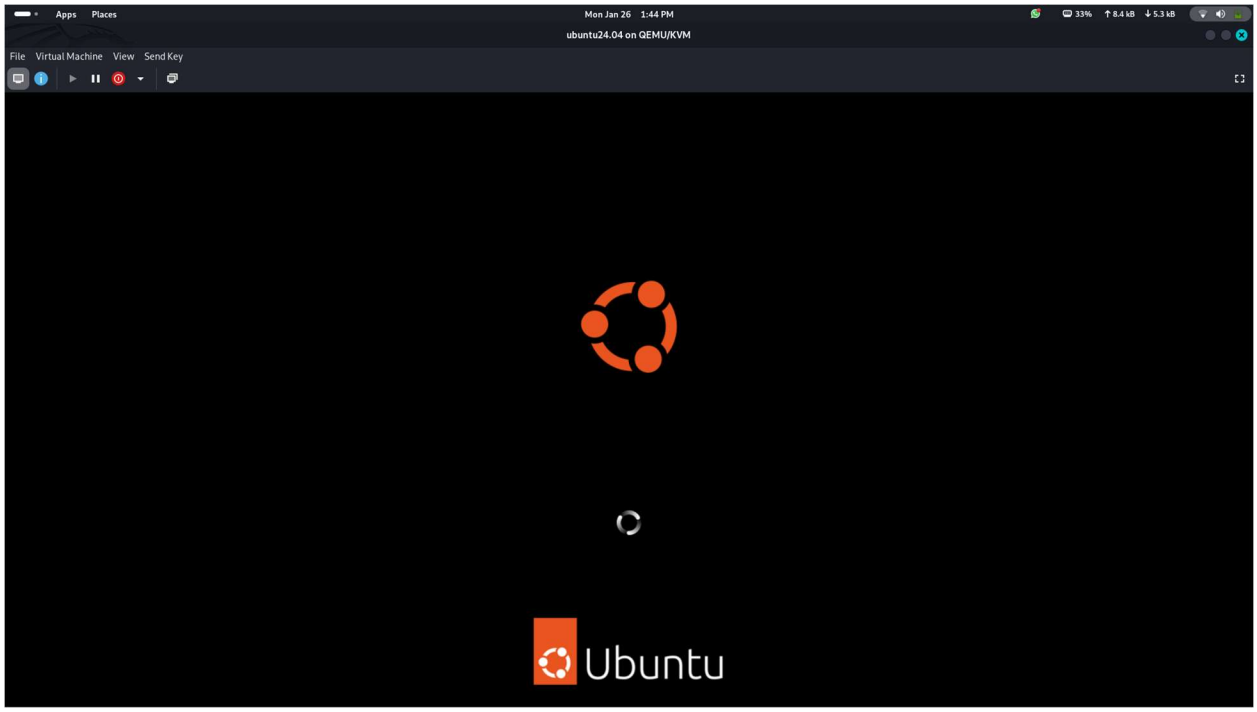

Apps
Places
Mon Jan 26 1:30 PM
27%
0.6 kB
5.4 kB
purushoth@kali: ~
┌──(purushoth㉿kali)-[~]
└─$ virt-manager
Virtual Machine Manager
File Edit View Help
Name
QEMU/
New VM
Create a new virtual machine
Step 3 of 5
Choose Memory and CPU settings:
Memory: 1090
Up to 15809 MiB available on the host
CPUs: 1
Up to 8 available
Cancel
Back
Forward


Apps
Places
Mon Jan 26 1:35 PM
34%
0.2 kB
4.7 kB
Virtual Machine Manager
File Edit View Help
Open
Name
CPU usage
QEMU/KVM
ubuntu24.04
Running


Apps
Places
Mon Jan 26 1:40 PM
28%
0.4 kB
6.2 kB
ubuntu24.04 on QEMU/KVM
File Virtual Machine View Send Key
Overview
OS information
Performance
CPUs
Memory
Boot Options
VirtIO Disk 1
SATA CDROM 1
NIC :5d:09:ed
Tablet
Mouse
Keyboard
Display Spice
Sound ich9
Serial 1
Channel (qemu-ga)
Channel (spice)
Video Virtio
Watchdog
Controller USB 0
Controller PCIe 0
Controller SATA 0
Controller VirtIO Serial 0
USB Redirector 1
USB Redirector 2
RNG /dev/urandom
Add Hardware
Details
XML
Virtual Disk
Source path:
Browse
Device type: SATA CDROM 1
Disk bus: SATA
Storage size: -
Advanced options
Readonly:
Shareable:
Serial:
Cache mode: Hypervisor default
Discard mode: Hypervisor default
Remove
Cancel
Apply

Screenshot–2: Ubuntu Desktop running inside VM





Method 2: Server Virtual Machine (Headless VM)

Description

A **server virtual machine** runs **without a graphical interface** and is accessed remotely using SSH.

- **Guest OS**: Ubuntu Server 22.04 LTS
- **Tool Used**: KVM / QEMU
- **VM Type**: Server VM (No GUI)
- **Access Method**: SSH

Procedure

1. Open **virt-manager** and create a new VM.
2. Select **Ubuntu Server 22.04 ISO**.
3. Allocate CPU, RAM, and storage.
4. Start VM and proceed with **text-based installation**.
5. Set username and password.
6. Enable **OpenSSH Server** during installation.
7. Complete installation and reboot VM.
8. Obtain server IP address using:

```
ip a
```

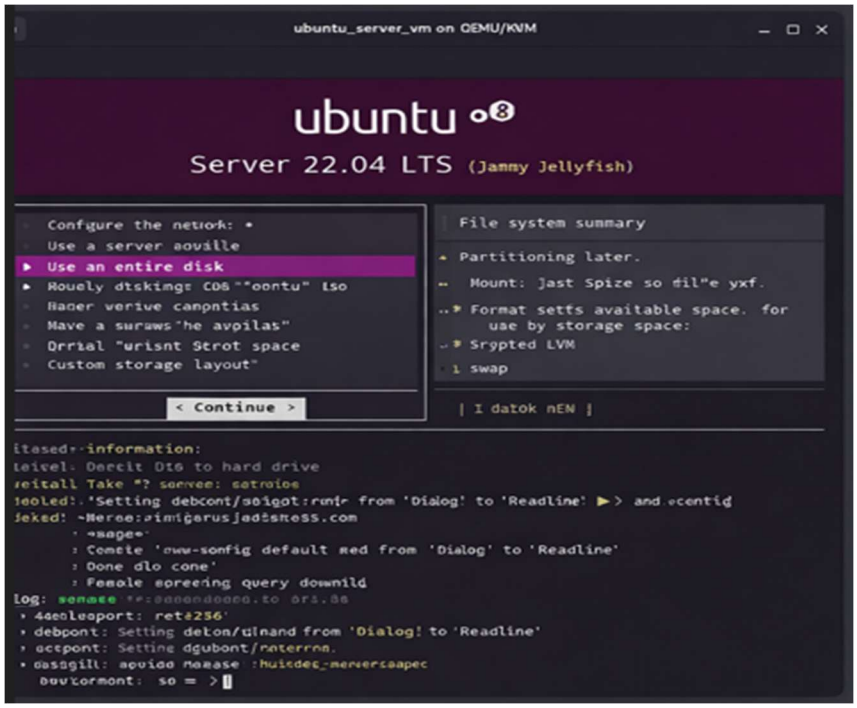
9. Access the server from host machine using SSH:

```
ssh username@<server-ip
```

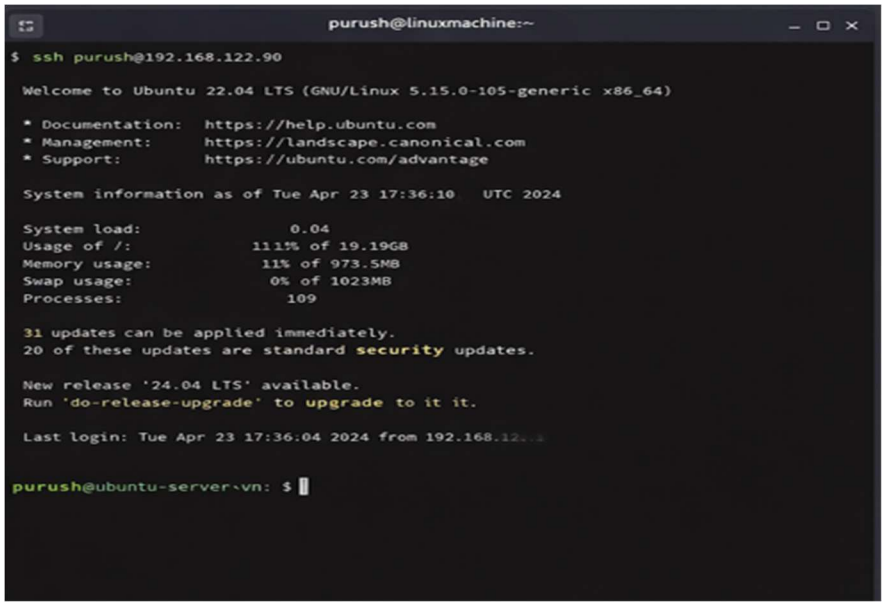
Observation

- Ubuntu Server installed successfully.
- SSH access established without errors.
- Server operated efficiently without GUI.

Screenshot–3: Ubuntu Server installation / terminal



Screenshot–4: SSH access to Server VM



Method 3: Cloud Virtual Machine

Description

A **cloud virtual machine** runs on a remote cloud platform and is accessed over the internet.

- **Platform**: AWS EC2
- **Guest OS**: Ubuntu Server 22.04 LTS
- **Instance Type**: t2.micro
- **Authentication**: SSH key-based login

Procedure

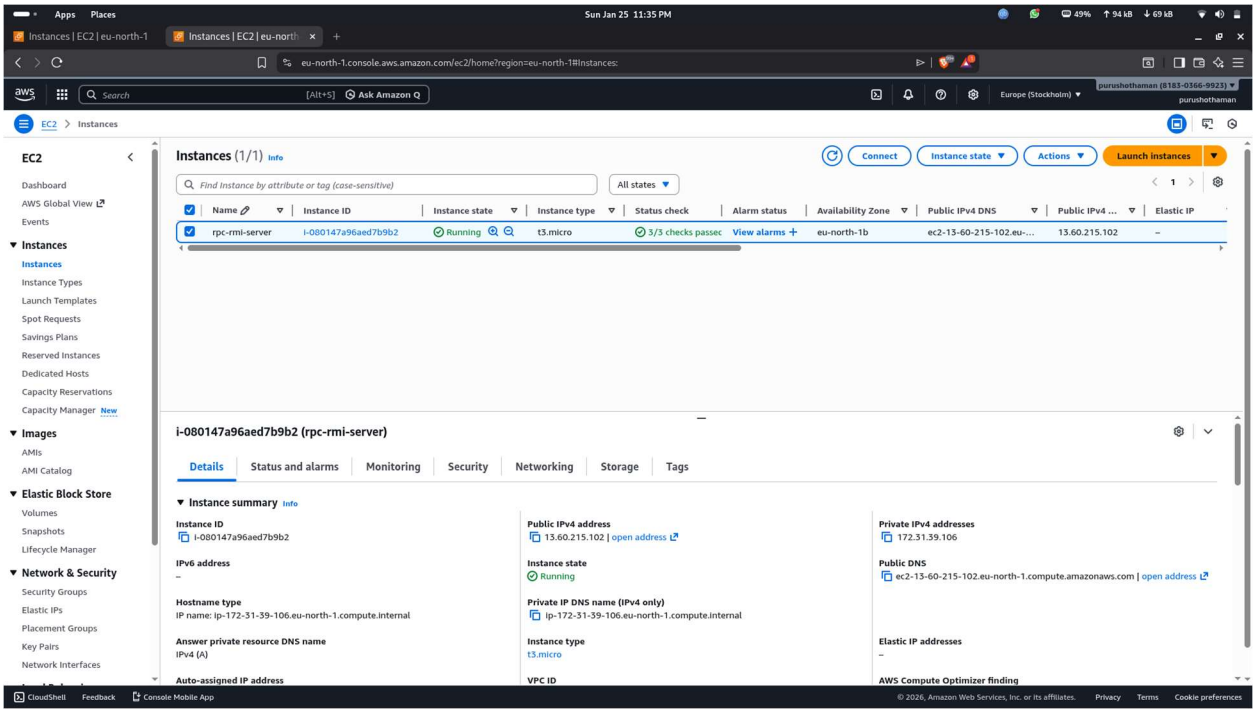
1. Login to **AWS Management Console**.
2. Navigate to **EC2 Dashboard**.
3. Click **Launch Instance**.
4. Select **Ubuntu Server 22.04 LTS AMI**.
5. Choose instance type **t2.micro**.
6. Create or select a **key pair (.pem file)**.
7. Configure **Security Group**:
    a. Allow SSH (port 22)
8. Launch the instance.
9. Copy **Public IP address**.
10. Connect to cloud VM using SSH:

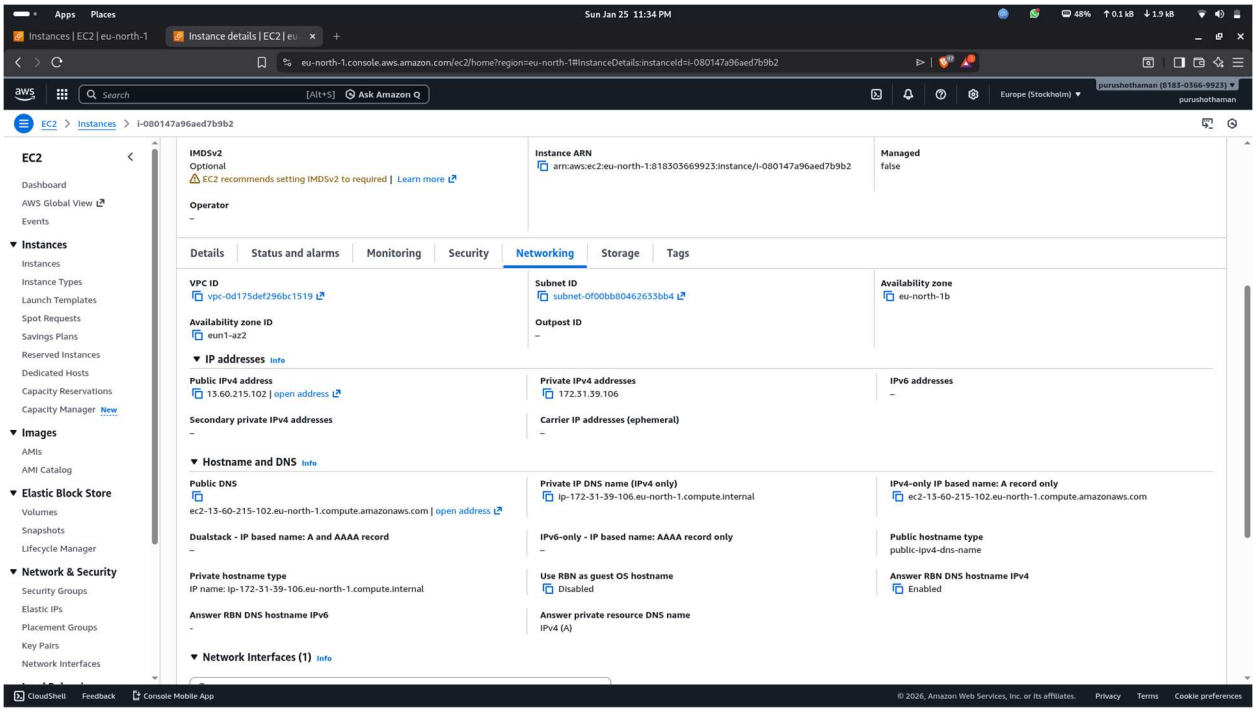
```
ssh -i key.pem ubuntu@<public-ip>
```

Observation

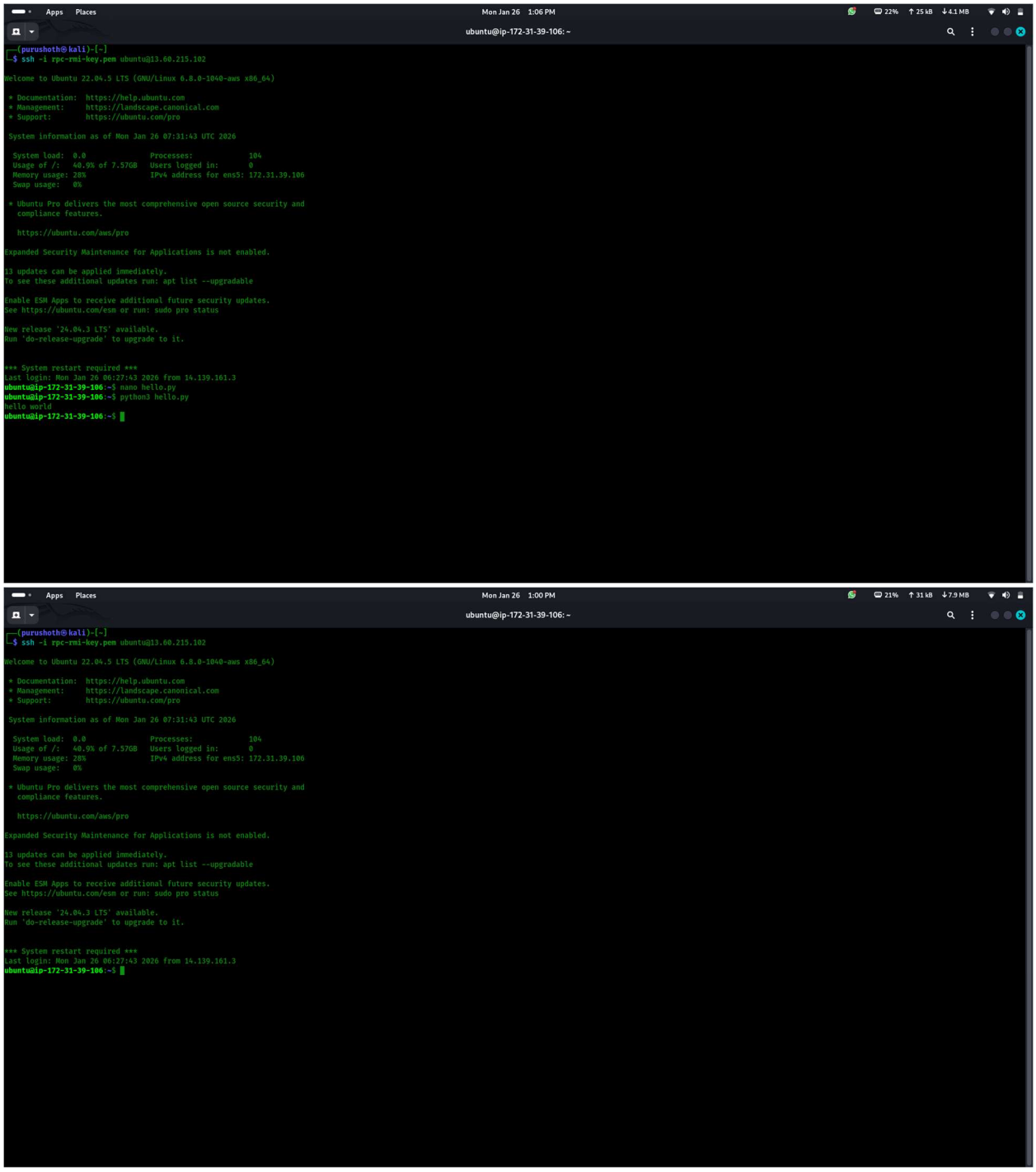
- EC2 instance launched successfully.
- Secure SSH login established using key authentication.
- Cloud VM accessible from anywhere via internet.

Screenshot–5: AWS EC2 instance running





Screenshot–6: SSH login to cloud VM



Output

- Desktop VM with GUI executed successfully.
- Server VM accessed remotely using SSH.
- Cloud VM accessed securely via AWS EC2.

Result

Successfully implemented and executed:

- Desktop Virtual Machine
- Server (Headless) Virtual Machine
- Cloud Virtual Machine

Conclusion

Virtual machines provide **complete hardware and OS-level isolation**, making them suitable for:

- Desktop computing
- Server hosting
- Cloud infrastructure

Though VMs consume more resources, they offer **high security and flexibility**.