PROJECT REPORT

ON

"Introduction to Virtualization with VirtualBox:Installing and Configuring Kali Linux"

Submitted By:
Akhil Bhushan Rehalia , UID- 24MCA20299

Under The Guidance of:

Mr. Rishabh Tomar

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University Institute of Computing

Chandigarh University,

Mohali, Punjab

CERTIFICATE

This is to certify that Akhil Bhushan Rehalia (UID- 24MCA20299) have successfullycompleted the project title **"Introduction to Virtualization with VirtualBox:Installing and Configuring Kali Linux"** at University Institute of Computing under my supervision and guidance in the fulfilment of requirements of first semester,**Master of Computer Application-Specialization in General.** Of Chandigarh University, Mohali, Punjab.

Dr. Abdullah	Mr. Rishabh Tomar
Head of the Department	Project Guide Supervisor
University Institute of Computing	University Institute of Computing

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We shall remain grateful to Dr. Manisha Malhotra, Additional Director, University Institute of Technology, for providing us a strong academic atmosphere by enforcing strict discipline to do the project work with utmost concentration and dedication.

Finally, we must say that no height is ever achieved without some sacrifices madeat some end and it is here where we owe our special debt to our parents and our friends for showing their generous love and care throughout the entire period of time.

Date: 04.11.2024

Place: Chandigarh University, Mohali, Punjab

Akhil Bhushan Rehalia, UID- 24MCA20299

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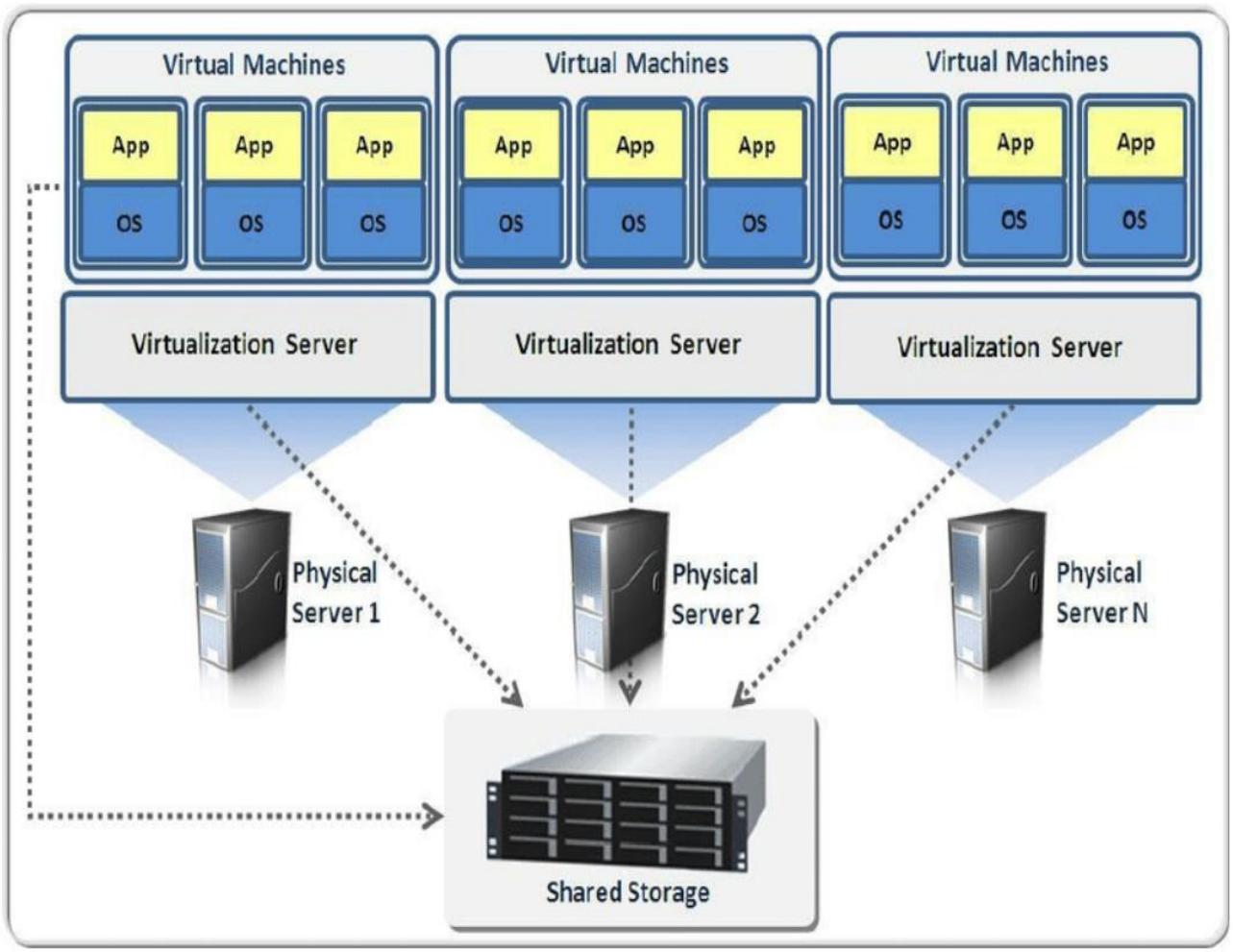
Introduction to Virtualization with VirtualBox: Installing and Configuring Kali Linux

1. What is Virtualization?

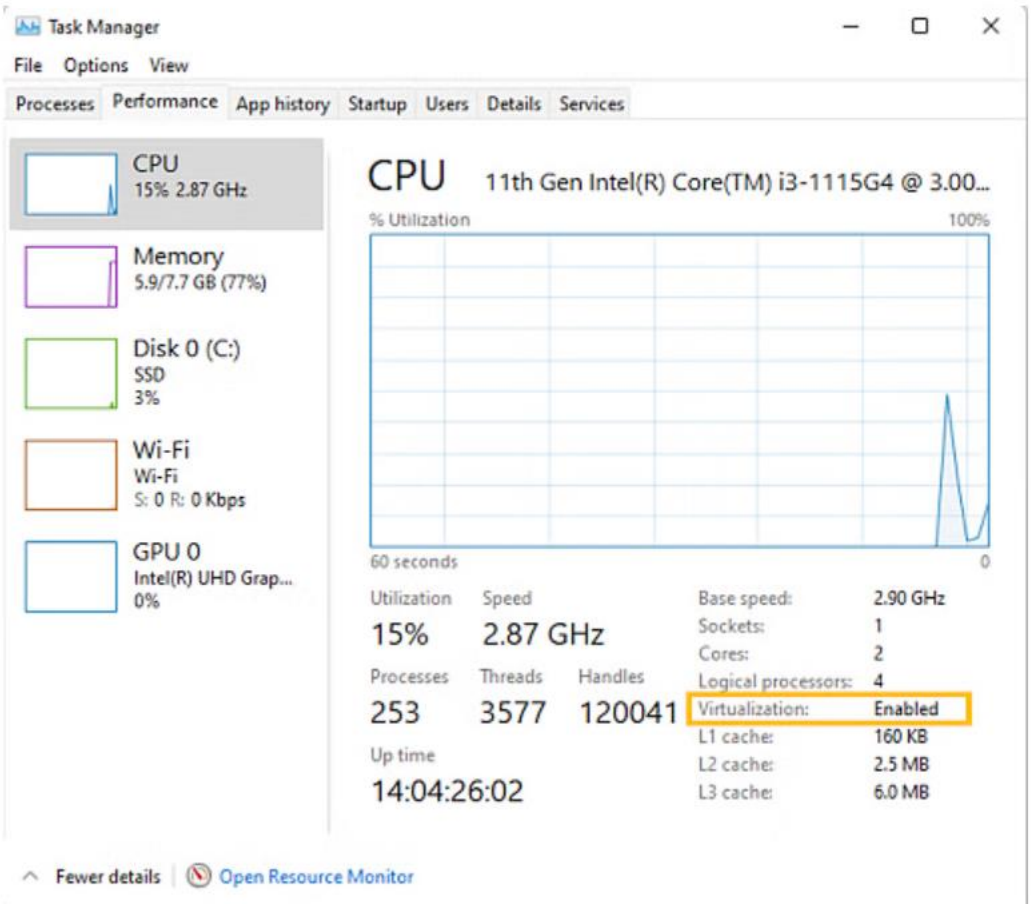
Have you ever wished you could run multiple operating systems on your computer at the same time? That's where virtualization comes in! Virtualization is a technology that allows you to create virtual versions of physical computers, enabling you to run different operating systems on a single machine. This is incredibly useful for developers, testers, and anyone who wants to experiment with different software environments without the hassle of managing multiple physical computers.



Benefits of Virtualization

So, why should you care about virtualization? Here are some key benefits:

- **Efficiency:** You can maximize your hardware usage by running multiple operating systems on one computer.
- **Cost-Effective:** With virtualization, you don't need to invest in several physical machines.
- **Isolation:** Each virtual machine (VM) operates independently, so if one crashes, it won't affect the others.
- **Flexibility:** You can easily create, modify, or delete VMs as your needs change.



Types of Virtualization

There are several types of virtualization you might encounter:

- **Full Virtualization:** This simulates complete hardware, allowing any operating system to run as if it were on its own physical machine.

- **Paravirtualization:** The guest operating system knows it's running in a virtual environment, which can improve performance.
- **OS-level Virtualization:** This runs multiple instances of an operating system on a single kernel (think Docker).

2. Overview of VirtualBox

What is VirtualBox?

Now that we understand virtualization, let's talk about one of the most popular tools for creating virtual machines: Oracle VM VirtualBox. It's free and open-source software that allows you to create and manage VMs on various operating systems like Windows, macOS, and Linux.

Key Features of VirtualBox

VirtualBox comes with several impressive features:

- **Cross-Platform Compatibility:** You can run it on different operating systems without any hassle.
- **Snapshots:** You can save the state of a VM at any point and return to it later.
- **Shared Folders:** Easily transfer files between your host machine and VMs.
- **Networking Options:** Configure how your VMs connect to the internet or communicate with each other.

System Requirements

Before diving into installation, make sure your computer meets these basic requirements:

Hardware Requirements : –

- **Processor:** 1 GHz or faster (32-bit / 64-bit)
- **RAM**: Minimum 512 MB (1 GB recommended for a smoother experience)
- **Storage:** 5 GB to 20 GB of free space for basic installations
- **Graphics**: VGA-compatible display (1024x768 resolution recommended)
- **Others:** CD/DVD drive or USB port for installation media

3. Installing VirtualBox

Downloading VirtualBox
To get started, go to the VirtualBox website and click on the "Downloads" section. Choose the version that matches your operating system.

Installation Steps for Different Operating Systems
Here's how to install VirtualBox based on your OS:
For Windows:

1. Run the downloaded installer.
2. Follow the prompts in the installation wizard.
3. Choose any additional options as needed.

For macOS:

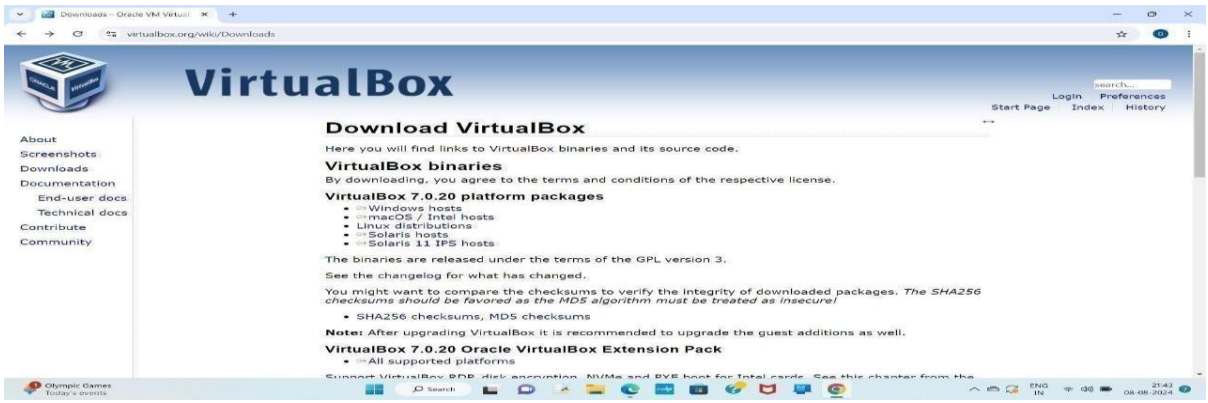
1. Open the downloaded DMG file.
2. Drag the VirtualBox icon into your Applications folder.
3. Launch it from Applications.

For Linux:

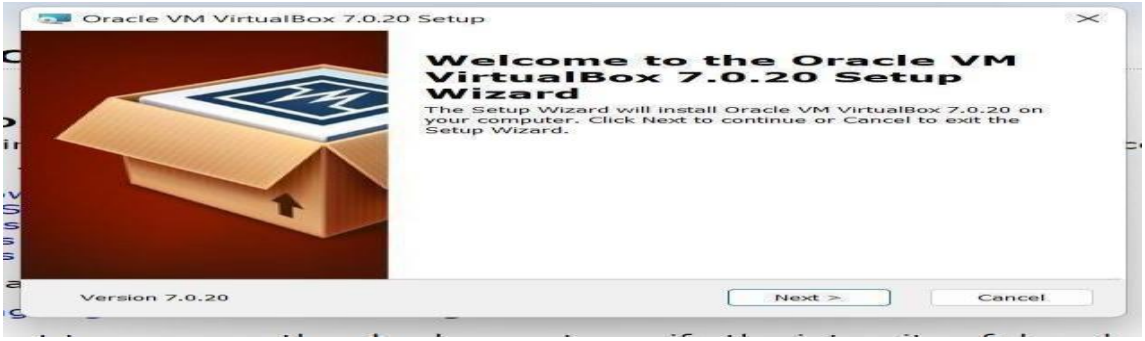
1. Use your package manager or download the appropriate package from the website.
2. Follow specific installation instructions for your distribution.

INSTALLATION OF VIRTUAL BOX: --

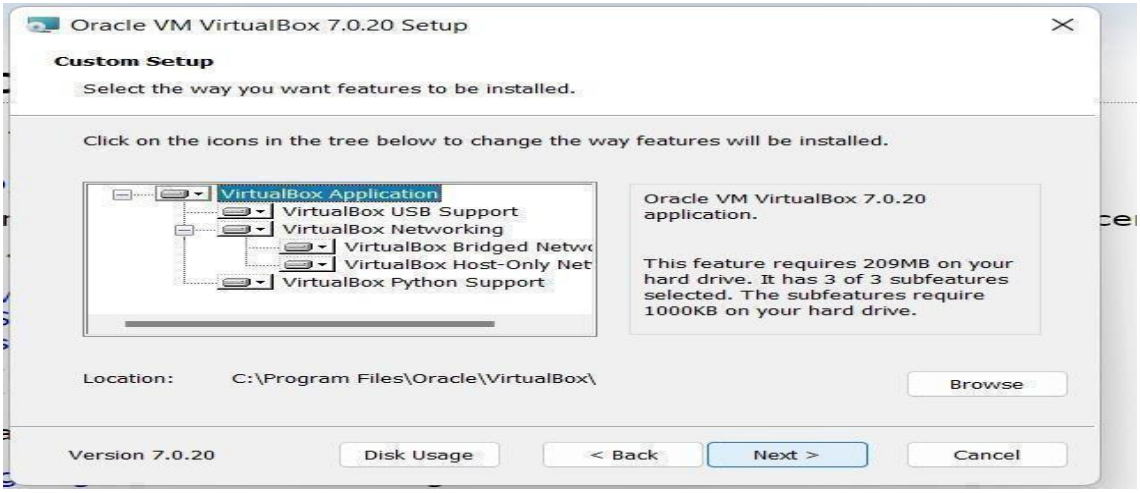
- **STEP 1:** Go to the official website of virtual box and start downloading



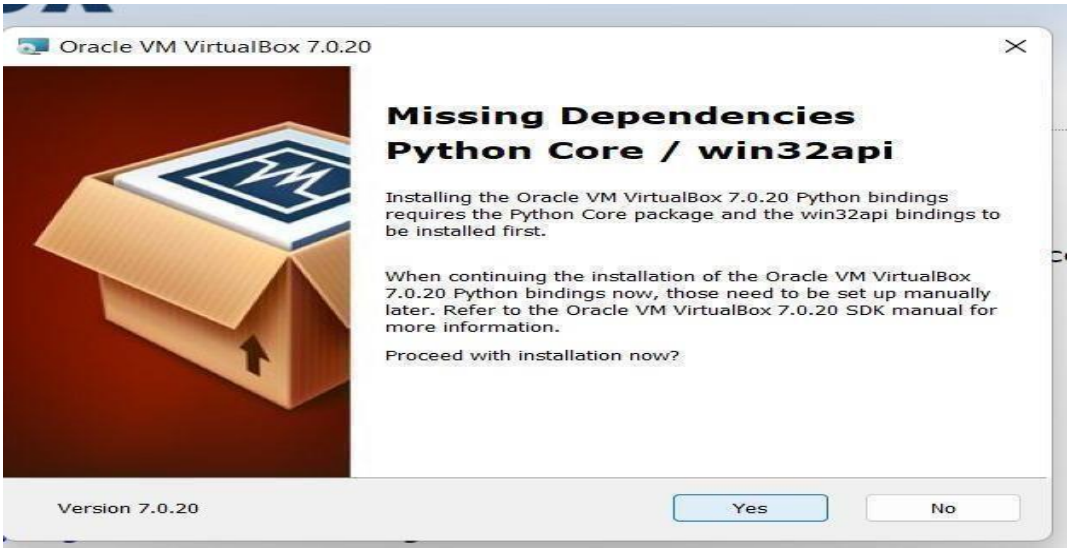
- **STEP 2:** After downloading of virtual box installing interface will open. And click on next option.



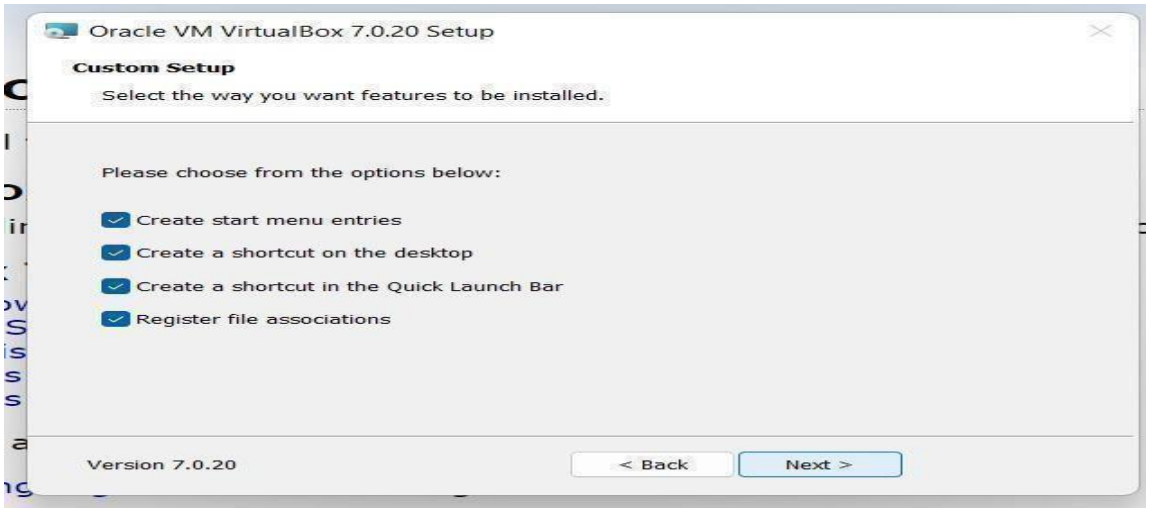
- **STEP 3:** Click on next button.



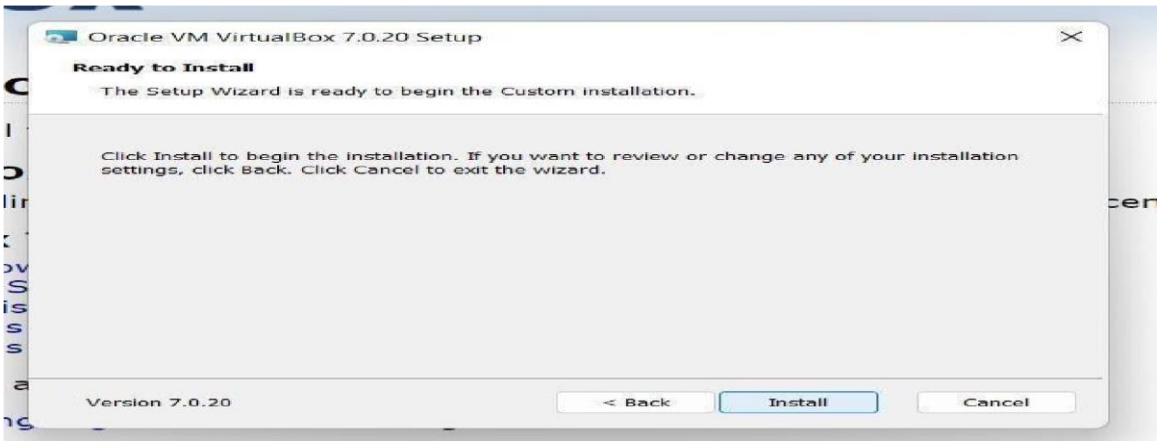
- **STEP 4:** Click on yes option.



- **STEP 5:** Select all the option and click on next option.



- **STEP 6:** Click on install, to install virtual box.



- **STEP 7:** Click on finish option to finish installation

4. Creating Your First Virtual Machine

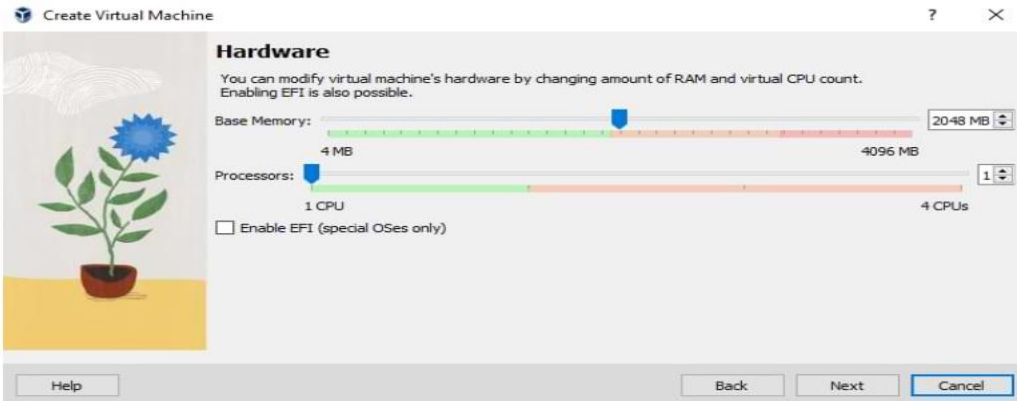
Step-by-Step Guide to Creating a VM

Once you have VirtualBox installed, let's create your first virtual machine!

1. Open VirtualBox and click on "New".

2. Give your VM a name (e.g., "My First VM") and select the type and version of the OS you want to install (like Linux or Windows).

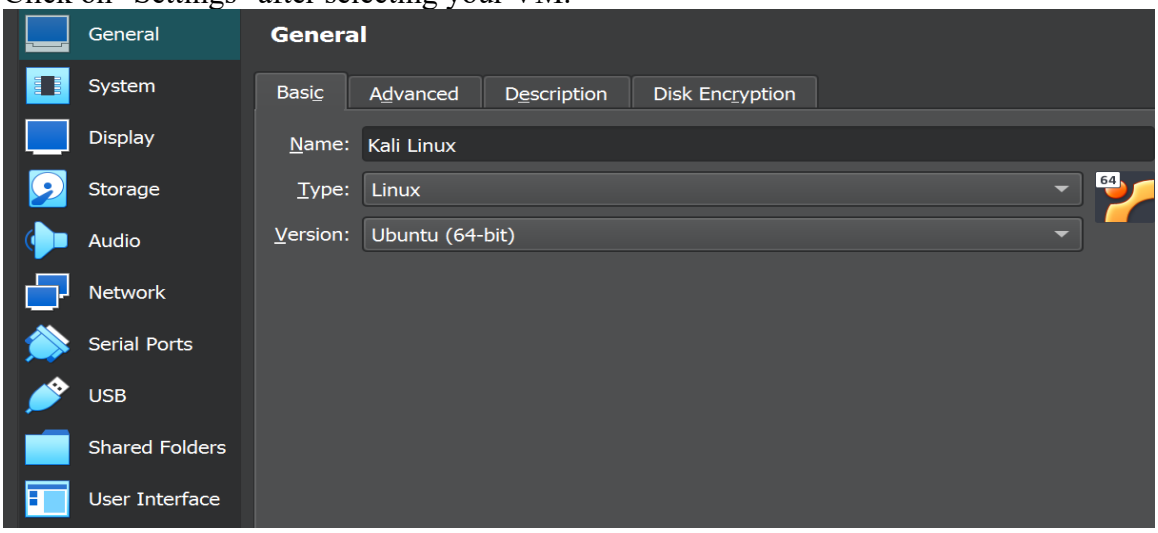
3. Allocate memory (RAM) based on what you need; more RAM usually means better performance.



Configuring VM Settings

After creating your VM, you can adjust its settings:

1. Click on "Settings" after selecting your VM.

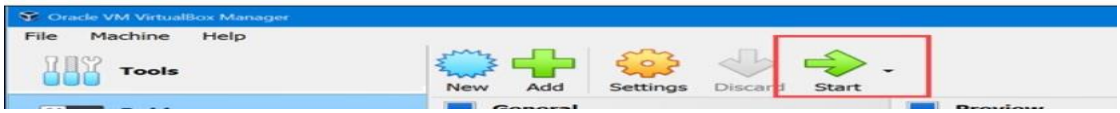


2. Here, you can change settings like system resources (CPU and RAM), storage options (attach an ISO file), and network configurations.

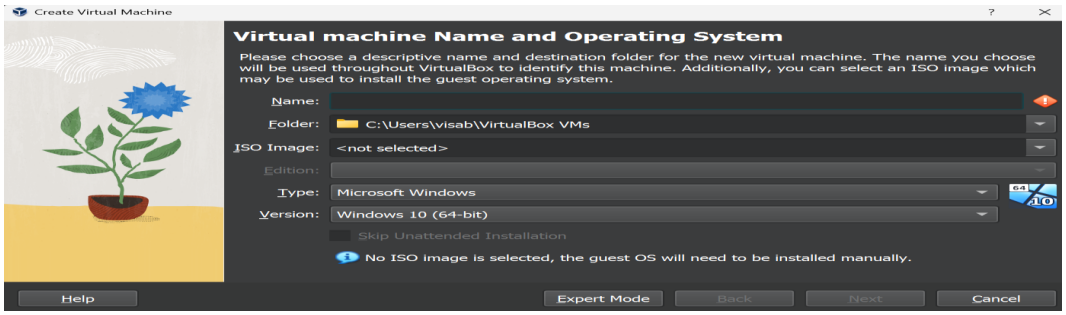
Installing an Operating System on the VM

Now it's time to install an operating system:

1. Start your VM by clicking "Start".



2. When prompted, select the ISO file for the OS you want to install.



3. Follow the installation steps just like you would on a physical computer.

5. Configuring Kali Linux in VirtualBox

What is Kali Linux?

Kali Linux is a special version of Linux designed for penetration testing and security auditing. It comes preloaded with many tools that help security professionals test systems for vulnerabilities. Kali Linux has hundreds of tools that perform different information security activities, including penetration testing, security research, computer forensics, and reverse engineering.

It is a cross-platform solution that is easily accessible and offered for free to information security experts and enthusiasts. Debian has been a very reliable and stable distribution for many years, offering a solid base for the Kali Linux desktop.

History of Kali Linux

Kali Linux is based on years of knowledge and expertise in developing penetration testing operating systems gained from previous projects. Because the crew has always been small, just a few distinct developers have worked on each of these projects. As a result, Kali has been in the making for years and has come a long way.

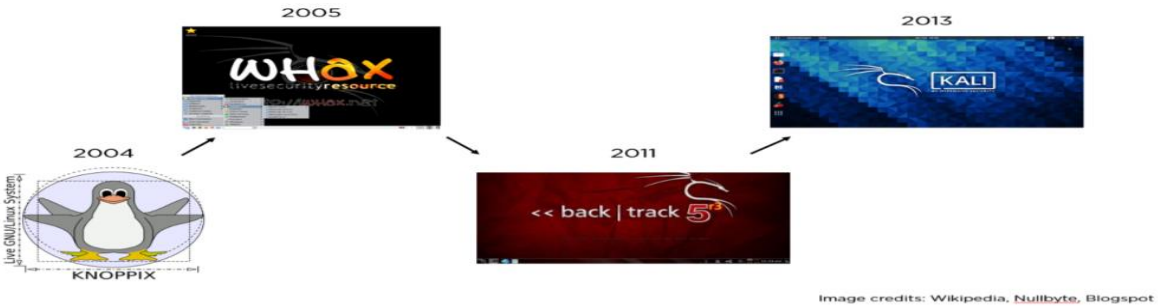


Image credits: Wikipedia, Nullbyte, Blogspot

Features of Kali Linux

Pre-installed tools

Safe Development

Multilingual OS

ARM support

- **Pre-installed Tools:** The latest version of Kali Linux has over 600 penetration tools pre-installed. After thoroughly examining each tool offered in BackTrack, developers deleted many scripts that did not work or copied other services that provided the same or comparable functionality.
- **Safe Development Team:** The Kali Linux team comprises a small number of people who are the only ones trusted to contribute packages and communicate with the repository, all while utilizing various security protocols. Restricting access of essential codebases to external assets substantially minimizes the danger of source contamination.
- **Multilingual OS:** Although penetration tools are often designed in English, Kali's developers have ensured that it contains genuine multilingual support, allowing more users to work in their local language and locate the tools they require for their penetration testing journey.
- **ARM Support:** Kali Linux is accessible on a broad range of ARM devices, and ARM repositories are integrated with the mainline version, so the tools mentioned above are updated in tandem with the rest of the distribution.

Ways to Install Kali Linux

There are four distinct ways to use Kali Linux on a personal computer.


Live USB Mode


Hard Disk Installation


Virtualization

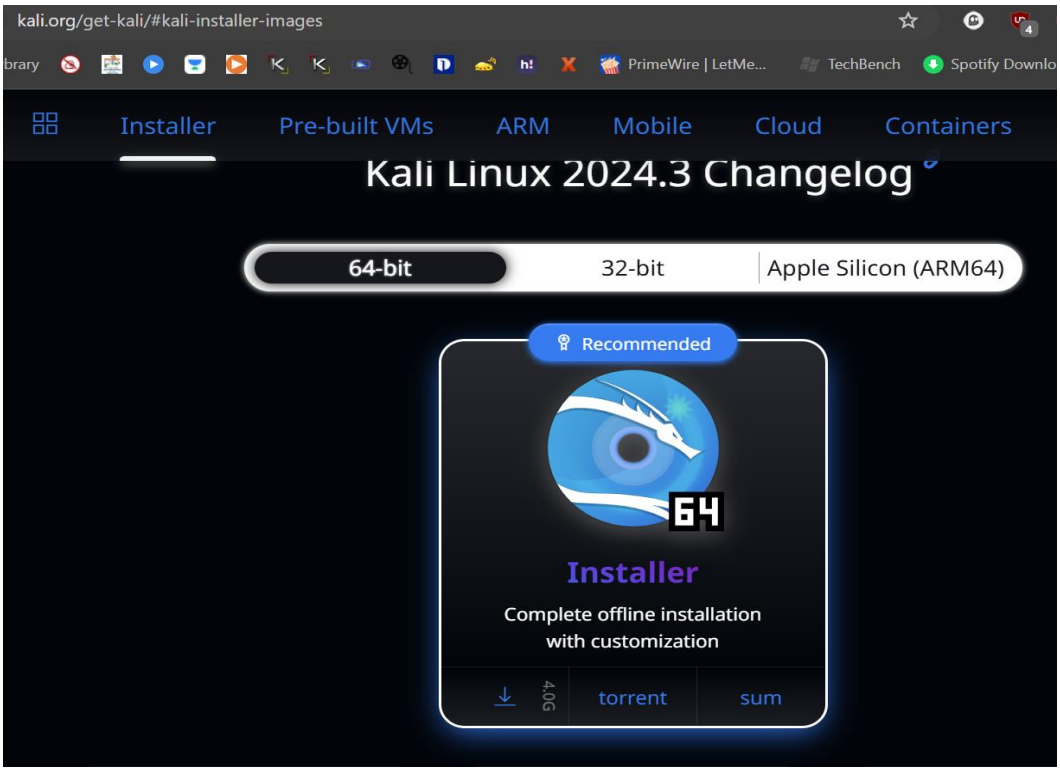

Dual-Boot with Windows

- **Virtualization :-** Kali Linux can be run as an operating system in a host OS as a virtual machine instance. The hardware requirements are completely customizable. Using both a host machine and guest operating system like Kali Linux allows users a safe environment to learn while not putting their systems at risk.

Downloading Kali Linux ISO

To get Kali Linux:

1. Visit the Kali Linux website. https://www.kali.org/get-kali/.
2. To install our operating system on a VMWare machine, we need to get the ISO file. This ISO file acts as the installation setup and can be found on the official website
3. Choose the version that suits your needs and download the ISO file.



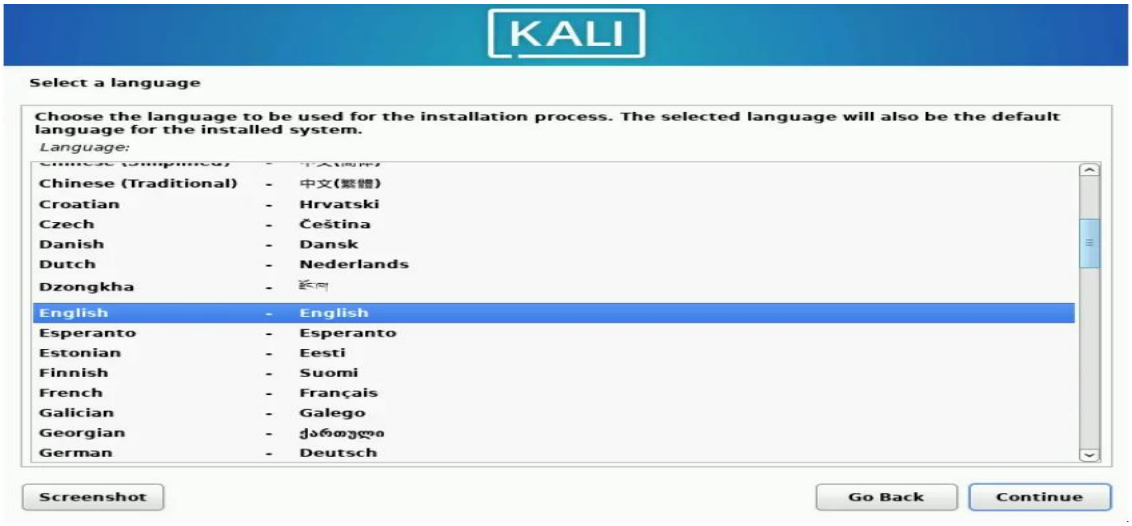
Installing Kali Linux in a VM

Follow similar steps as before to install Kali Linux in your newly created VM using its ISO file.

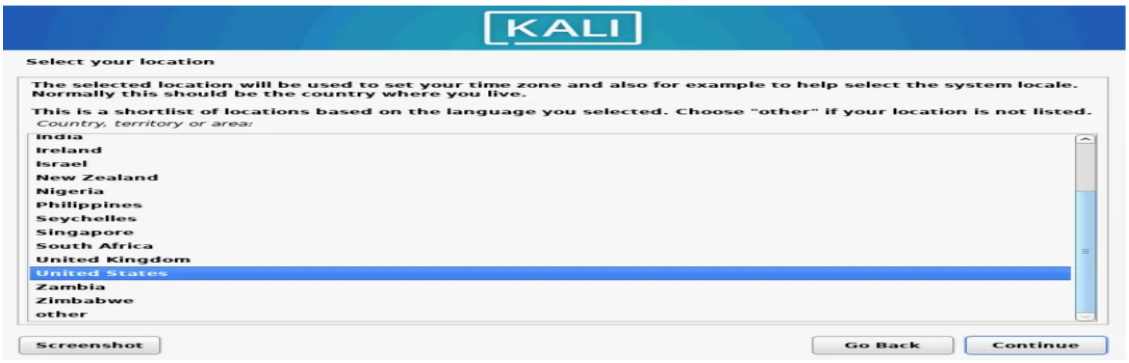
- **Step 1:** Now Start

- **Step 2:** Now Select 'Install Kali

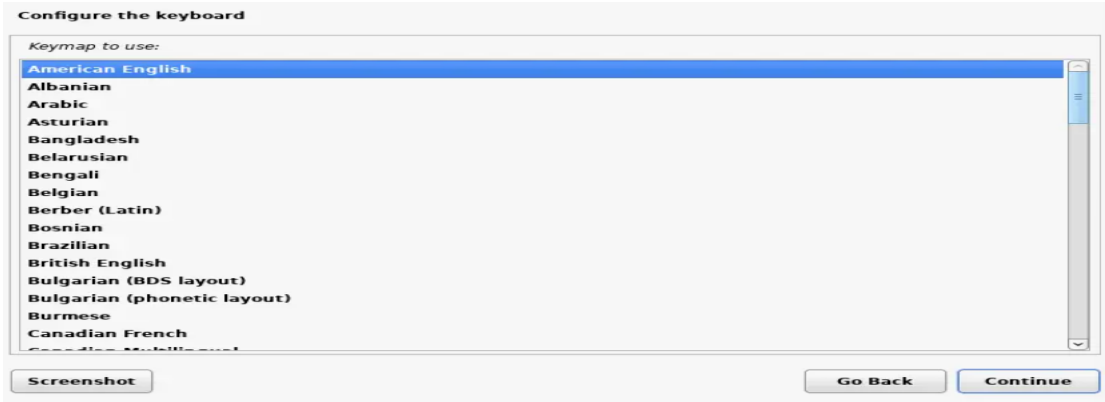
- **Step 3:** Now Select language.



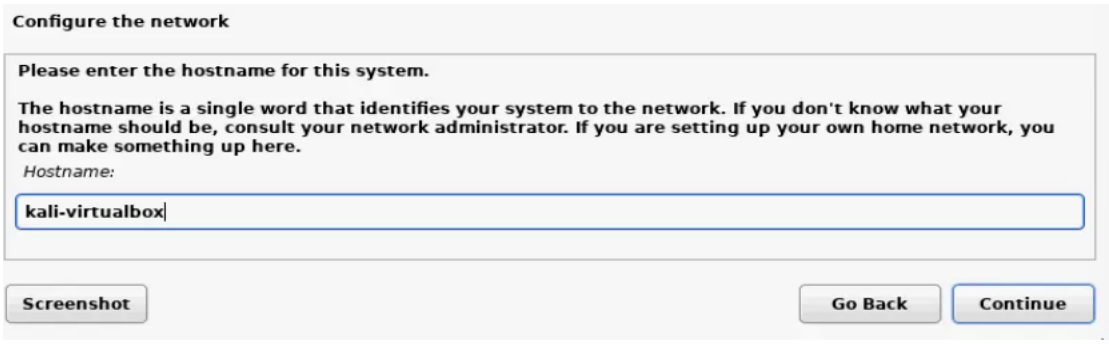
- **Step 4:** Now Select location



- **Step 5:** Now Select your keyboard layout

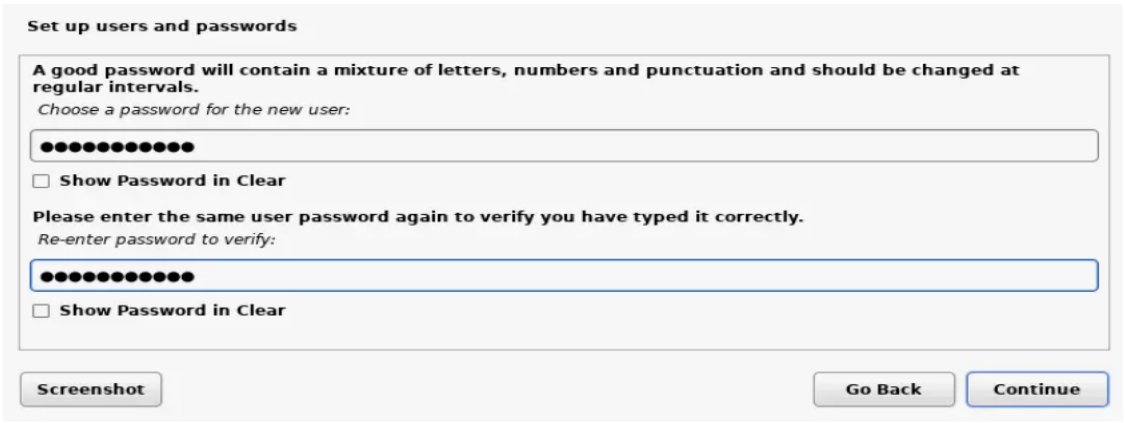


- **Step 6:** Now network



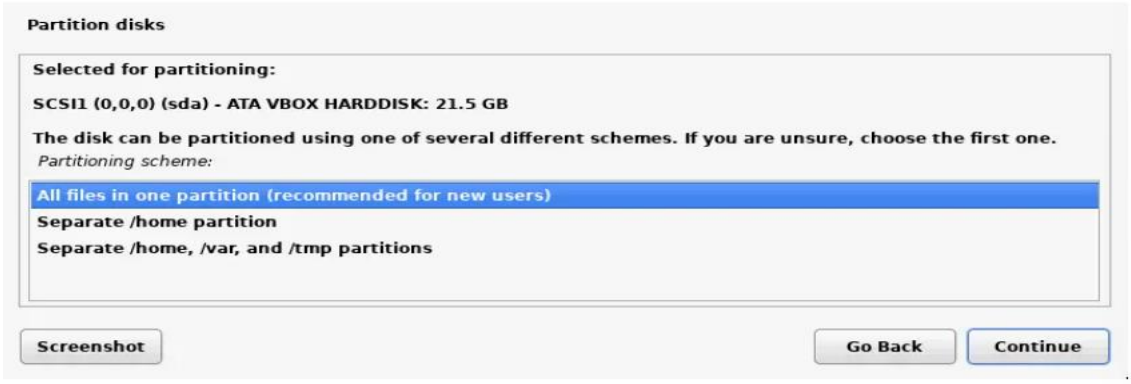
- **Step 7:** Now network **Configure the domain name**

- **Step 8:** Now **Set up usersname and passwords**

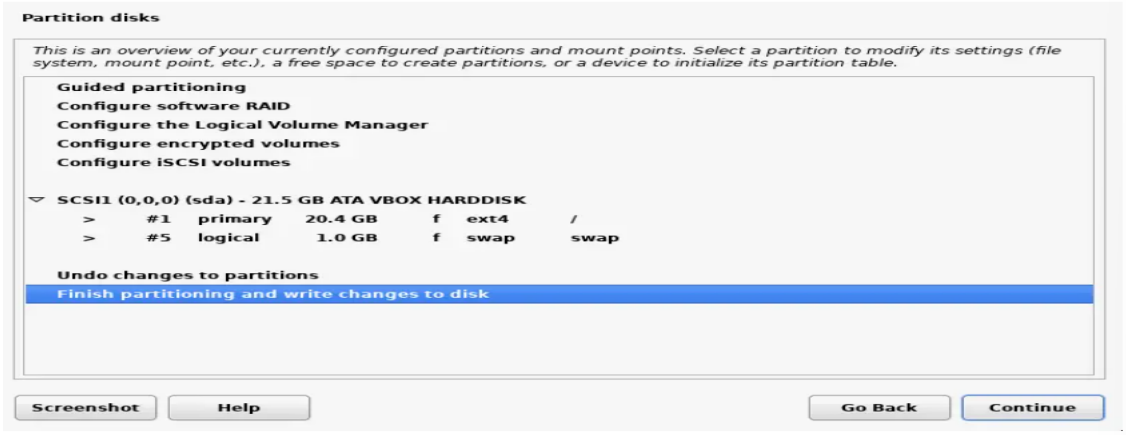


- **Step 9:** Now **Partition disks**

- **Step 10:** Now **All files in one partition**



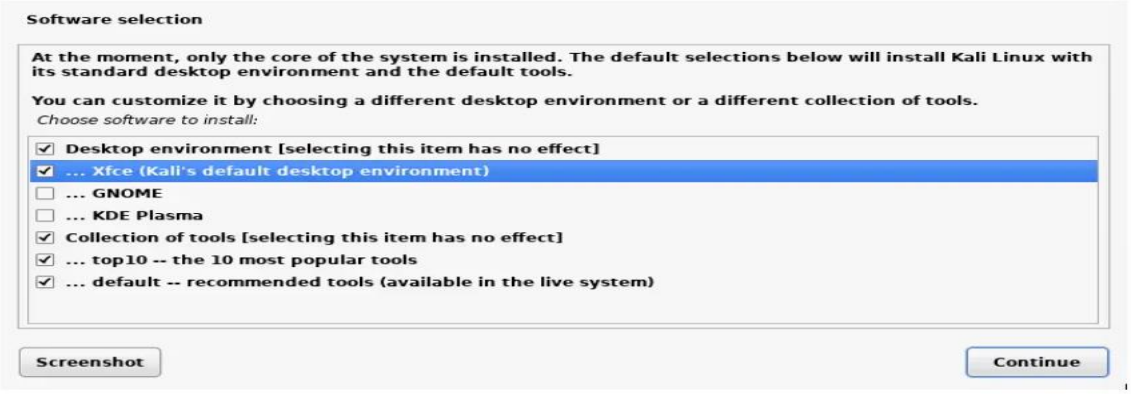
- **Step 11:** Now **Finish partitioning and write changes to disk**.



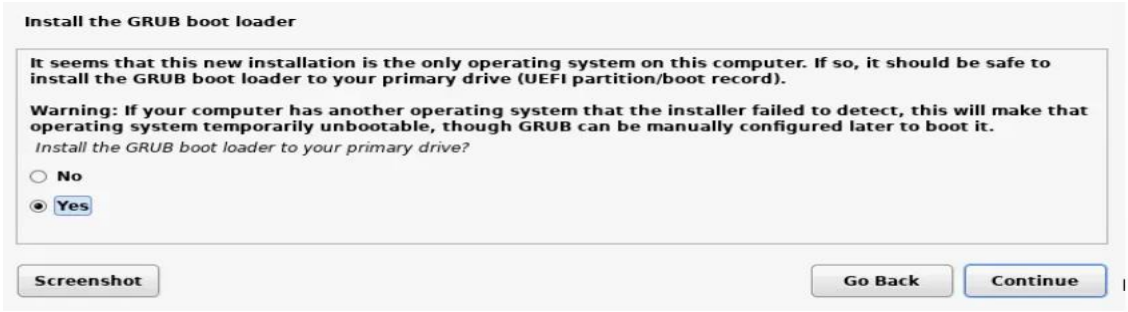
- **Step 12:** Now Select **Yes**

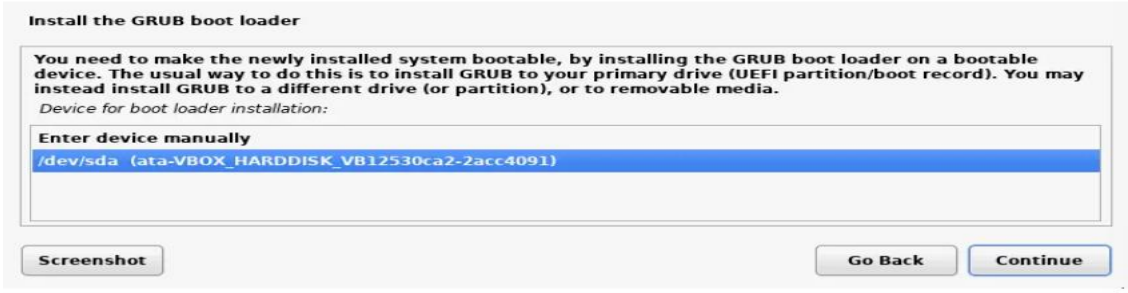
- **Step 13:** Now Wait for the system to be installed.

- **Step 14:** Now **Software selection**



- **Step 15:** Now **Install the GRUB boot loader on a hard disk**





- **Step 16:** Now **Finish the installation**

- **Step 17:** Now RESTART-

6. Using VirtualBox Features

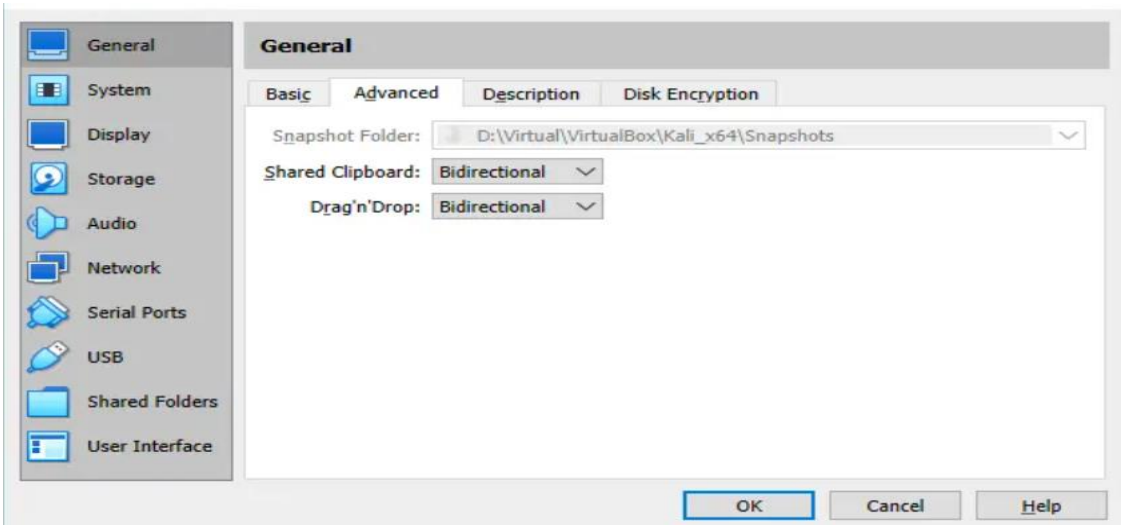
Snapshots and Cloning

Snapshots are handy! They let you save a VM's state at any time so you can return to it later if something goes wrong—like when you're testing new software or configurations that might not work out as planned. Cloning allows you to create an exact copy of a VM for testing different setups without starting from scratch.

Shared Folders

To set up shared folders between your host machine and your VM:

1. Go to "Settings" > "Shared Folders".

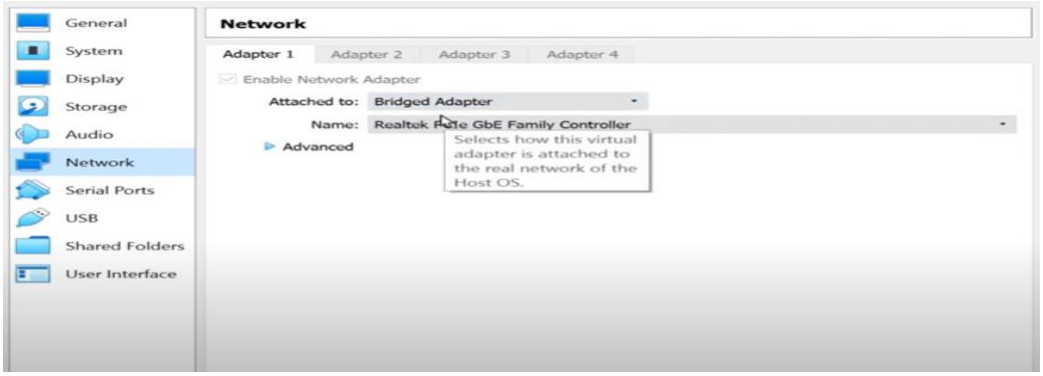


2. Add a folder from your host that you want accessible in your VM.

Networking Options

VirtualBox offers various networking modes:

- **NAT (Network Address Translation):** This allows VMs to access external networks while keeping them isolated from each other.
- **Bridged Adapter**: Connects VMs directly to your local network so they behave like separate devices.



7. Advanced Configuration and Usage

Using Guest Additions

Guest Additions are extra software that improves performance in VMs:

1. Start your VM and go to "Devices" > "Insert Guest Additions CD Image".
2. Follow the prompts inside your guest OS to install it.

Managing Multiple VMs

You can easily create, start, stop, and delete multiple VMs through the VirtualBox interface, making it simple to manage different projects or environments.

Command-Line Interface (CLI) for Advanced Users

If you're comfortable with command-line tools, VBoxManage allows advanced management tasks without using the graphical interface—perfect for those who prefer efficiency!

8. Practical Applications of Virtualization

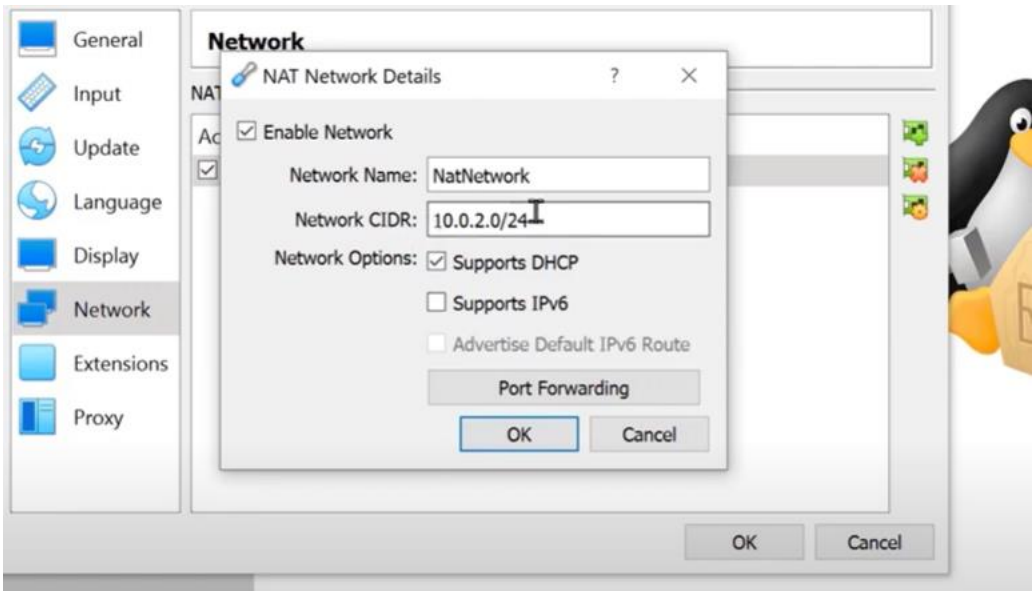
Virtualization has many real-world applications:

- **Testing Software: Developers** can test applications across different environments without needing multiple physical machines.
- **Learning and Development:** Students can learn about different operating systems safely within VMs without risking their main system's stability.
- **Security Testing with Kali Linux:** Use Kali Linux in a virtual environment to practice penetration testing techniques safely.

9. Troubleshooting Common Issues

Sometimes things don't go as planned! Here are some common problems users might face:

- **Network Connectivity Issues**: If VMs can't connect to the internet or each other, check network settings.



- **Performance Problems:** If VMs are slow, consider increasing allocated resources like RAM or CPU cores.

10. Conclusion

In this the Kali Linux installation, we started by learning to download the correct ISO file and setting up VMware before installation, run the live boot installer of Kali Linux, and configure our virtual machine's partitions to install the operating system finally. , virtualization with Oracle VM VirtualBox offers flexibility, efficiency, and safety when working with different operating systems and applications. Virtualization can help you to deploy virtual machines from the data center to build a secure cloud-based infrastructure. By understanding its features and capabilities, users can leverage this technology effectively for various purposes such as development, testing, and learning new skills in a secure environment.

11. References

1. Oracle Corporation. (n.d.). Oracle VM VirtualBox Documentation. Retrieved from https://www.virtualbox.org/manual/
2. Offensive Security Ltd. (n.d.). Kali Linux Documentation. Retrieved from https://www.kali.org/docs/
3. https://www.simplilearn.com/tutorials/cryptography-tutorial/what-is-kali-linux
4. https://www.simplilearn.com/enable-virtualization-windows-10-article
5. https://www.nakivo.com/blog/how-to-install-kali-linux-on-virtualbox/
6. https://www.researchgate.net/figure/llustration-of-the-concept-of-Virtualization-7_fig1_269636339