Project Report on

"Introduction to Virtualization with VirtualBox in linux"

Submitted by

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Subject : Linux Administration Lab
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Submitted to

Mr. Rishabh Tomar

in partial fulfilment for the award of the degree of

Master of Computer Application

Chandigarh University

Certificate

This is to certify that Kumari Adity (UID- 24MCA20289) have successfully completed the project title "Introduction to Virtualization with VirtualBox in 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.

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Dr. Abdullah   Mr. Rishabh Tomar

Head of the Department   Project Guide Supervisor
University Institute of Computing   University Institute of Computing

Acknowledgement

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We wish to reciprocate in full measure the kindness shown by Dr. Abdullah (H.O.D, University Institute of Computing) who inspired us with his valuable suggestions in successfully completing the project work.

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 made at 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.

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Abstract

Virtualization is a critical technology in modern computing, enabling multiple operating systems (OS) to run simultaneously on a single hardware platform. This project, "Introduction to Virtualization with VirtualBox in Linux," explores the implementation and significance of virtualization using VirtualBox, an open-source, cross-platform virtualization software developed by Oracle. The focus of this project is on deploying Linux-based systems within VirtualBox to understand how virtualization functions and its applications in both development and testing environments.

The primary objective of this project is to demonstrate the process of setting up and configuring VirtualBox on a host machine, installing a Linux-based guest operating system (Fedora Linux), and exploring its capabilities. The project outlines the steps required to create virtual environments, manage resources efficiently, and enable seamless interaction between the host and guest OS. By simulating different environments, developers and system administrators can optimize software performance, test multiple OS configurations, and deploy applications in isolated virtual environments without requiring separate physical machines.

This project underscores the benefits of virtualization, including hardware resource optimization, isolation, and flexibility, which are vital for businesses, developers, and system administrators. VirtualBox offers key features such as snapshot management, shared folders, and seamless mode, making it an ideal tool for creating portable and manageable virtual environments.

The project also highlights the significance of virtualization in areas like cloud computing, development, testing, and network security. By using VirtualBox and Linux together, users can harness the power of both technologies to create secure, scalable, and efficient virtual machines. This abstract provides a foundational overview of the practical aspects of virtualization with VirtualBox, demonstrating its potential for reducing costs, improving system efficiency, and enhancing software development workflows in Linux environments.

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Introduction

Virtualization is a powerful technology that allows multiple operating systems to operate concurrently on a single physical machine. By abstracting the underlying hardware, virtualization provides an environment where applications can run independently, enhancing flexibility and resource utilization. VirtualBox, developed by Oracle, is a widely-used open-source virtualization platform that facilitates the creation and management of virtual machines (VMs) on various operating systems, including Windows. This project, "Introduction to Virtualization with VirtualBox on Windows," aims to provide users with a comprehensive understanding of how to install VirtualBox, create and configure VMs, and utilize virtualization for testing, development, and deployment purposes. The project will guide users through the process of setting up VirtualBox on a Windows host system and installing a Linux guest operating system, such as Ubuntu. By leveraging VirtualBox, users can create isolated environments that allow for experimentation, testing of different software configurations, and running applications without the risk of affecting the host system. Virtualization also enables developers to replicate production environments, streamline application testing, and optimize hardware resources. This project emphasizes the significance of virtualization in contemporary computing, highlighting its applications in software development, IT management, and cloud computing. By mastering VirtualBox on Windows, users can enhance their technical skills and adapt to the evolving demands of the technology landscape.

1. 1.Objective

    The objective of this project is to explore virtualization technology using VirtualBox on a Windows operating system. Virtualization enables the creation of multiple virtual environments on a single physical machine, allowing for better resource utilization and management. This report covers the installation and configuration of VirtualBox in Windows, the creation and management of virtual machines, and an overview of the use cases for virtualization.

1.2. Background

Virtualization is a key technology in modern computing, enabling the abstraction of hardware resources to create isolated environments. It is commonly used in server consolidation, testing environments, and resource management in cloud computing. VirtualBox is a powerful open-source hypervisor for x86 virtualization. It is widely used due to its ease of use, flexibility, and support for a wide range of guest operating systems, including Linux, Windows, and macOS.

System Requirements

Before installing VirtualBox and creating virtual machines on a Windows system, ensure that your hardware and software meet the following minimum requirements:

1. **Host System Requirements**

• Operating System: Windows 10, Windows 8, Windows 7, or Windows Server (64-bit recommended).
• Processor: 64-bit Intel or AMD processor with virtualization support (Intel VT-x or AMD-V).
• RAM: Minimum of 4 GB (8 GB or more recommended for better performance).
• Hard Disk Space: At least 30 MB for VirtualBox installation, plus additional space for virtual machines (20 GB or more per VM is recommended).
• Graphics: Graphics card with support for hardware virtualization (optional but beneficial for 3D acceleration).

2. **Guest Operating System Requirements**

• Guest OS: VirtualBox supports various guest operating systems, including:
   • Linux distributions (e.g., Ubuntu, CentOS, Fedora, Kali Linux)
   • Windows versions (Windows 10, 8, 7)
   • Other operating systems (e.g., Solaris, FreeBSD)
• RAM for Guest OS: Allocate sufficient RAM based on the requirements of the guest OS being installed (e.g., at least 2 GB for Ubuntu).

3. **Additional Software Requirements**

• Admin Rights: Administrator privileges on the Windows host system are required for installation.
• Internet Connection: An active internet connection is recommended for downloading VirtualBox and guest OS installation files.

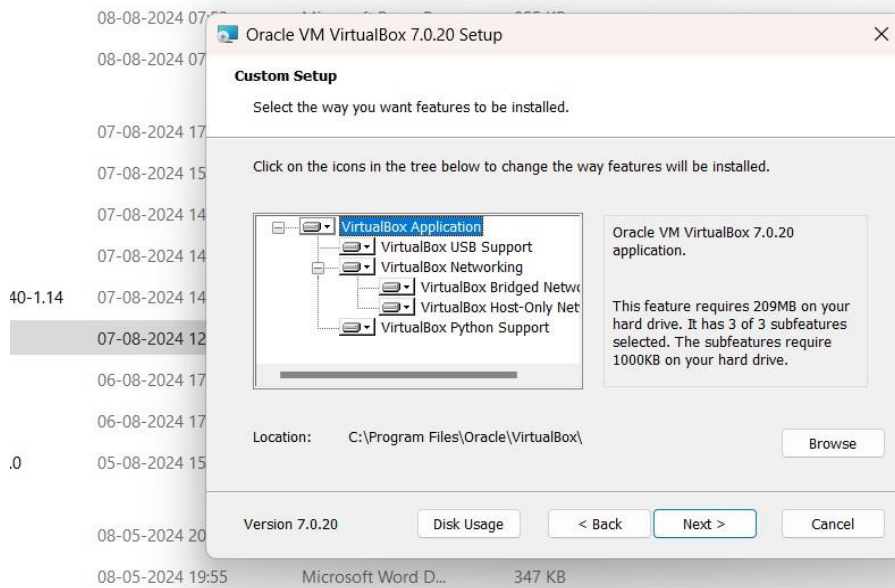## Download and Install VirtualBox on Windows

Step 1: Download VirtualBox

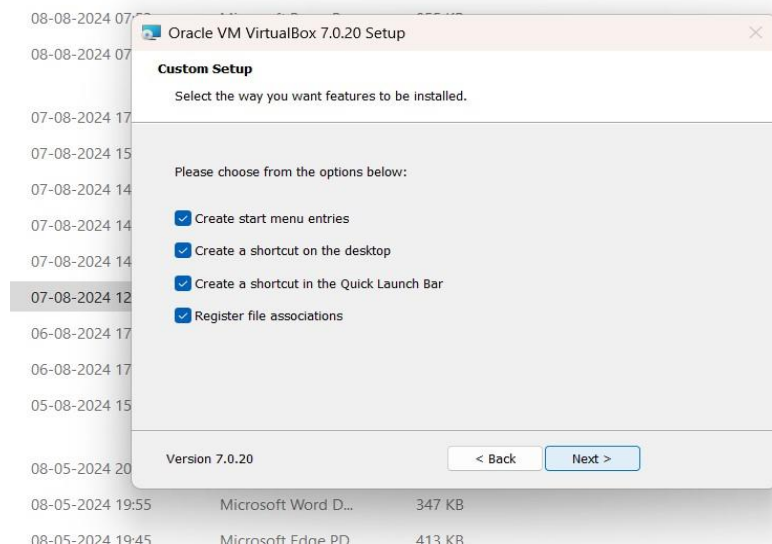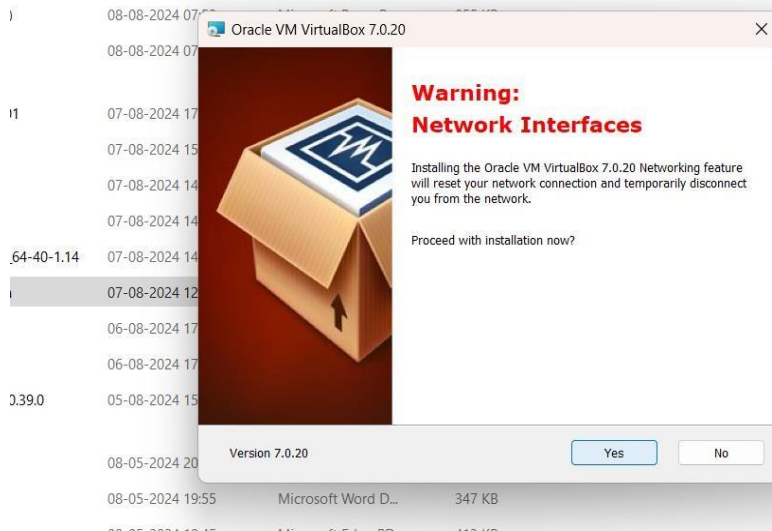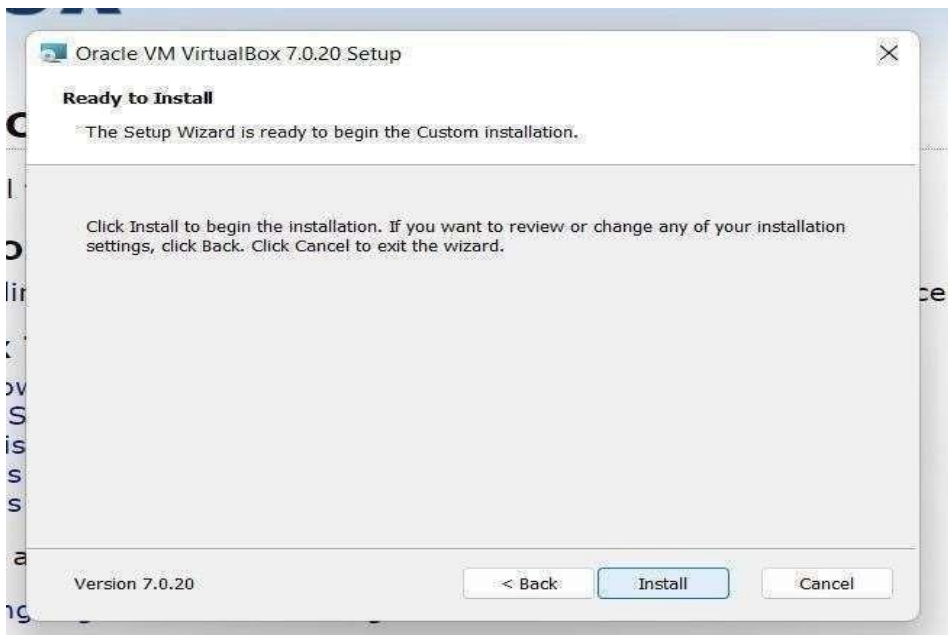1. Go to the [VirtualBox website](#) and download the latest version of VirtualBox for Windows.
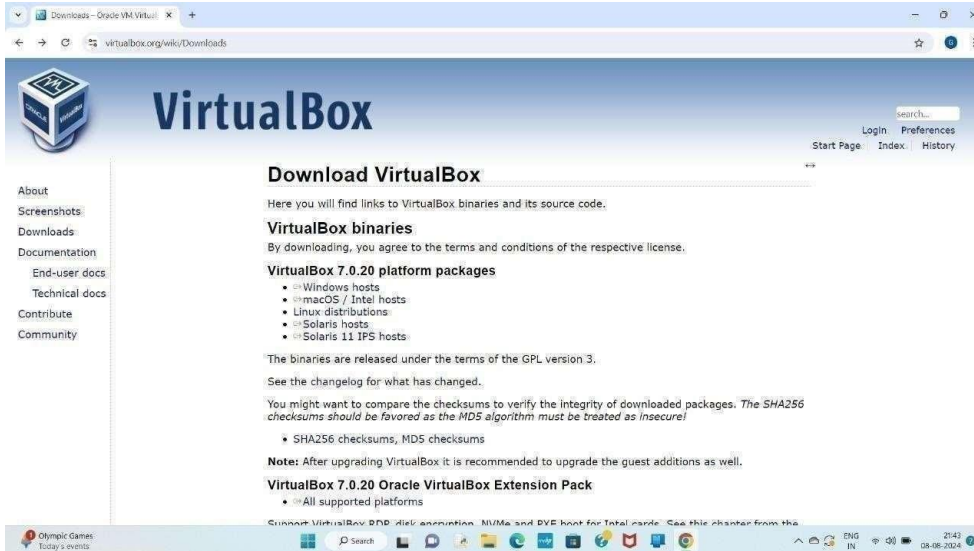
Step 2: Install VirtualBox

1. Run the installer you just downloaded (VirtualBox-x.x.x-xxxx-Win.exe).
2. In the installation wizard, click Next on the welcome screen.
3. Select the installation location (default is fine), and click Next.
4. The next screen will show some options for creating shortcuts. You can leave them as default.
5. Click Yes to install network interfaces (this is required for VirtualBox networking).
6. Click Install and wait for the installation to complete.

Oracle VM VirtualBox 7.0.20

Warning:
Network Interfaces

Installing the Oracle VM VirtualBox 7.0.20 Networking feature will reset your network connection and temporarily disconnect you from the network.

Proceed with installation now?

Version 7.0.20   Yes   No

Oracle VM VirtualBox 7.0.20 Setup

Custom Setup

Select the way you want features to be installed.

Please choose from the options below:

- ☑ Create start menu entries
- ☑ Create a shortcut on the desktop
- ☑ Create a shortcut in the Quick Launch Bar
- ☑ Register file associations

Version 7.0.20   < Back   Next >

Step 3: Launch VirtualBox

After the installation, VirtualBox will automatically launch. You'll see the main VirtualBox interface.
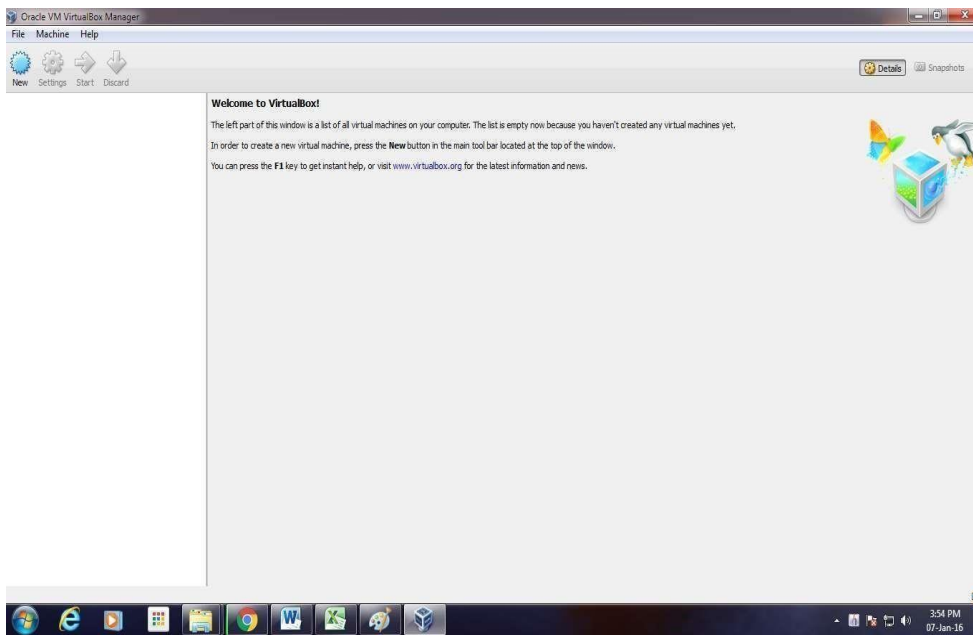
Download Fedora Linux ISO File

Step 1: Download Fedora Linux ISO

1. Go to the Fedora Linux Website: URL: https://fedoraproject.org/

Creating a Fedora Linux Virtual Machine in VirtualBox

Step 1: Open VirtualBox and click on "New" to create a new virtual machine.

1. In VirtualBox, click the New button to create a new virtual machine.
2. In the Name field, enter "Fedora Linux VM" or any name of your choice.
3. Under Type, select Linux, and under Version, select Debian (64-bit).
4. Click Next.
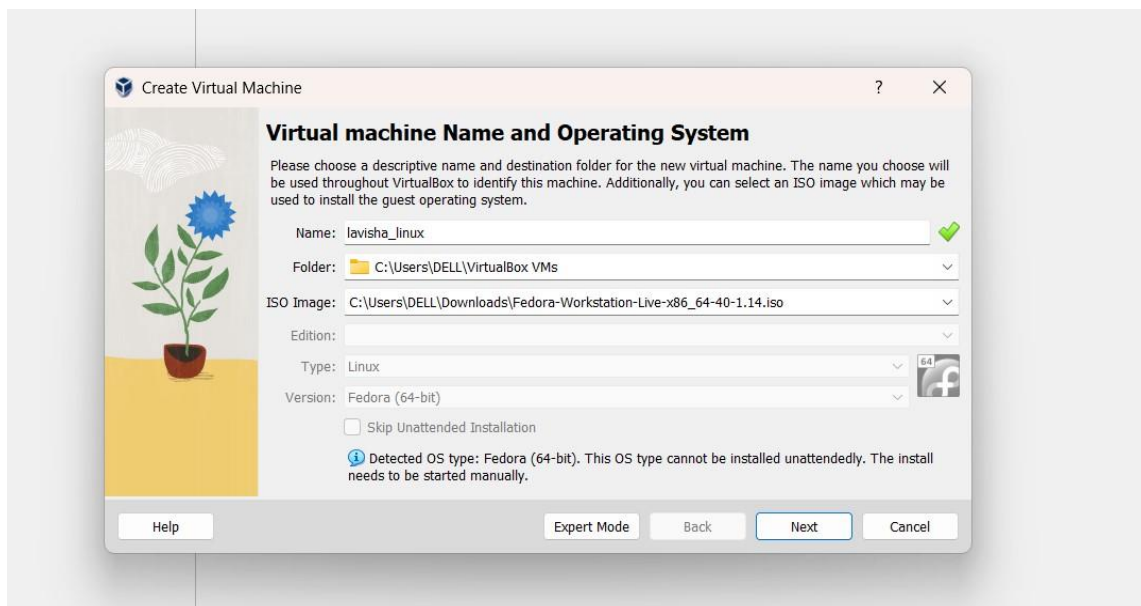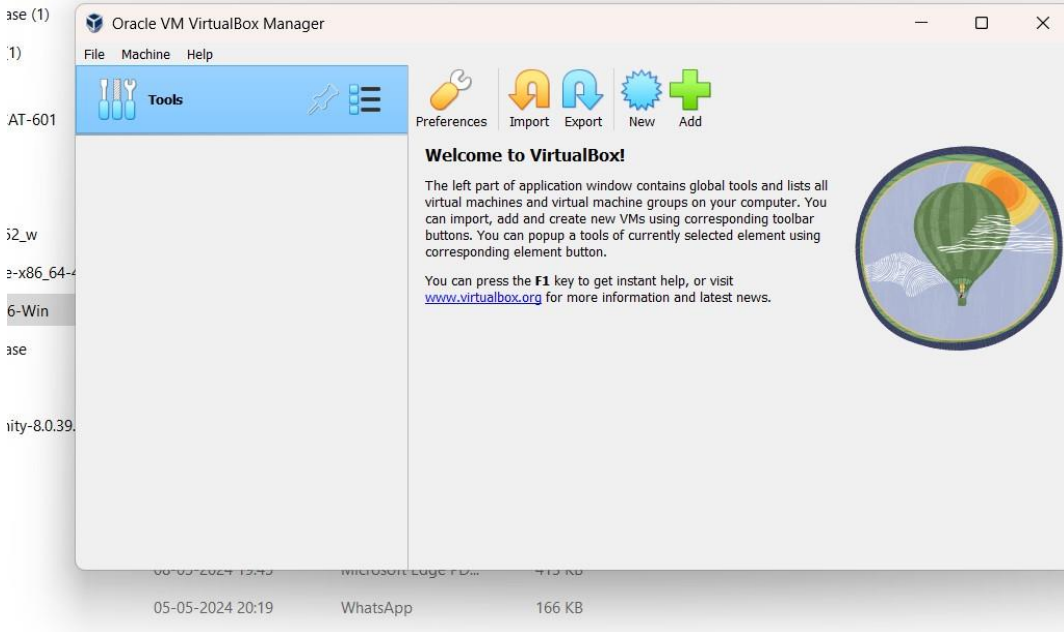
Step 2: Set Memory Size:

1. VirtualBox will ask you to allocate memory (RAM). Set at least 2048 MB (2 GB) or more, depending on your system's capabilities.

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2. Click Next.
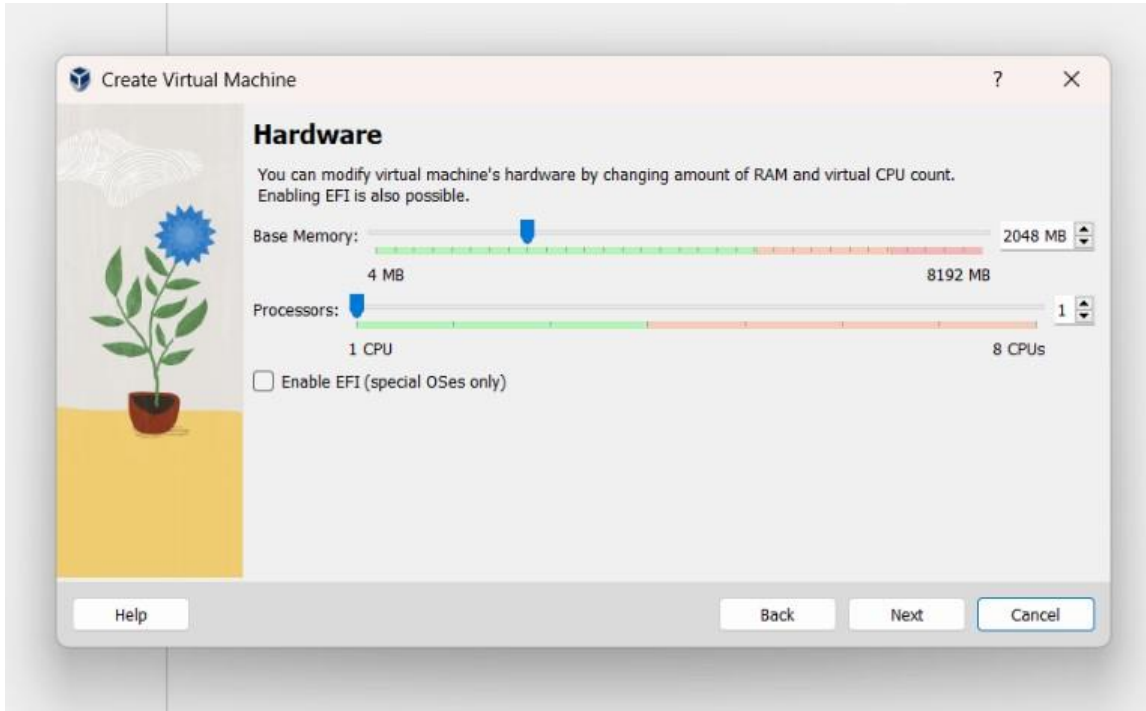
Step 3: Create a Virtual Hard Disk:

1. Select Create a virtual hard disk now and click Create.
2. Choose VDI (VirtualBox Disk Image).
3. Select Dynamically allocated.
4. Set the disk size to at least 20 GB (or more if you want), and click Create.
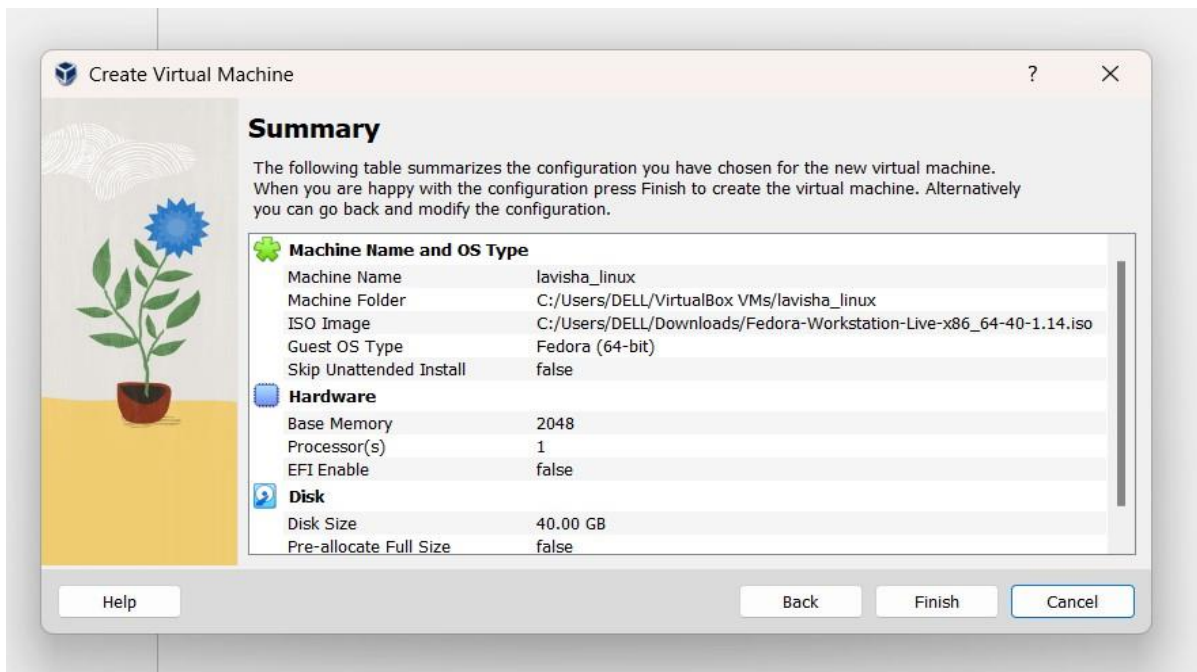
Install Fedora Linux on the Virtual Machine

Step 1: Start the Virtual Machine and select the Fedora Linux ISO file you downloaded.

1. In VirtualBox, select your newly created VM and click Start.
2. A window will appear asking you to select a start-up disk. Click on the folder icon and browse for the Fedora Linux ISO file you downloaded earlier.
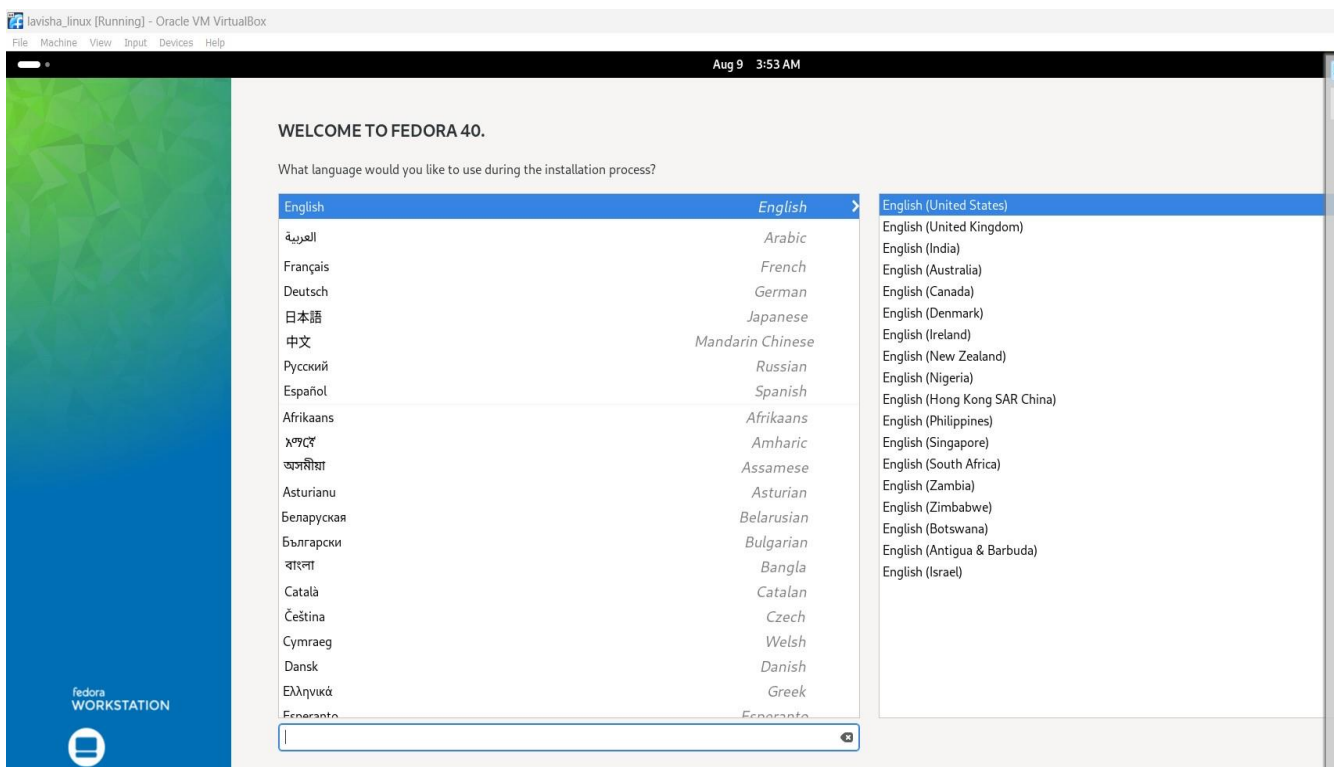3. Select the ISO and click Start.

Then click on show

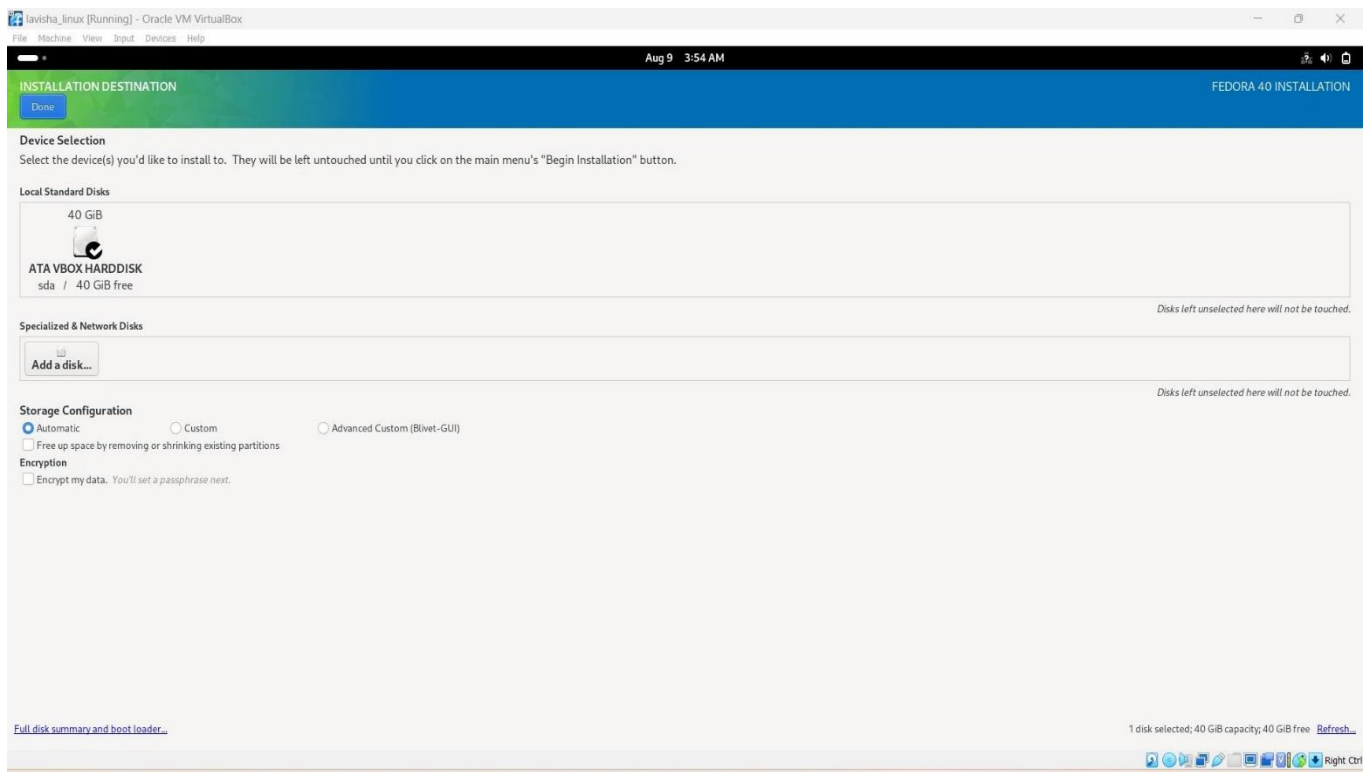Step 2: Begin the Installation

Here the actual installation starts

Step 3: Configure the Language, Time Zone, and Keyboard:

1. Choose your keyboard layout (default is usually fine) and click Continue Select the language
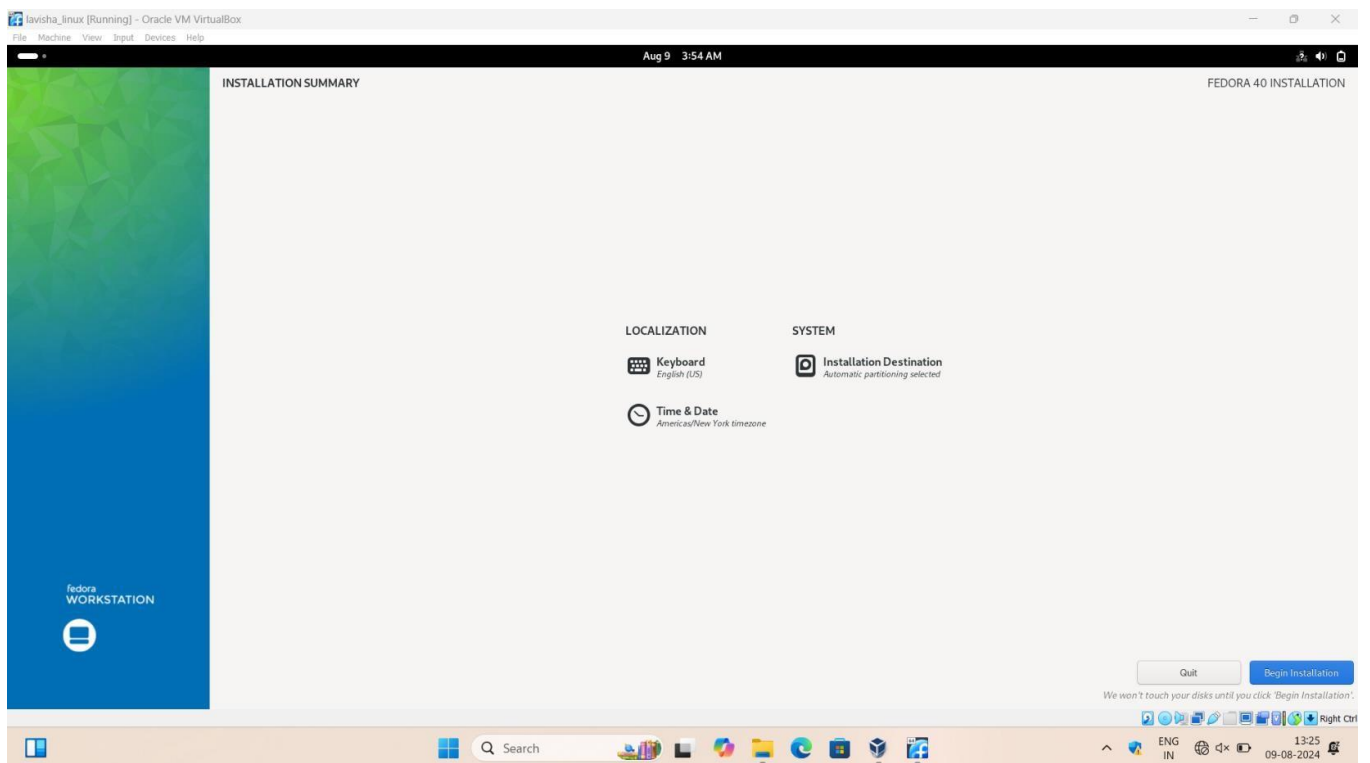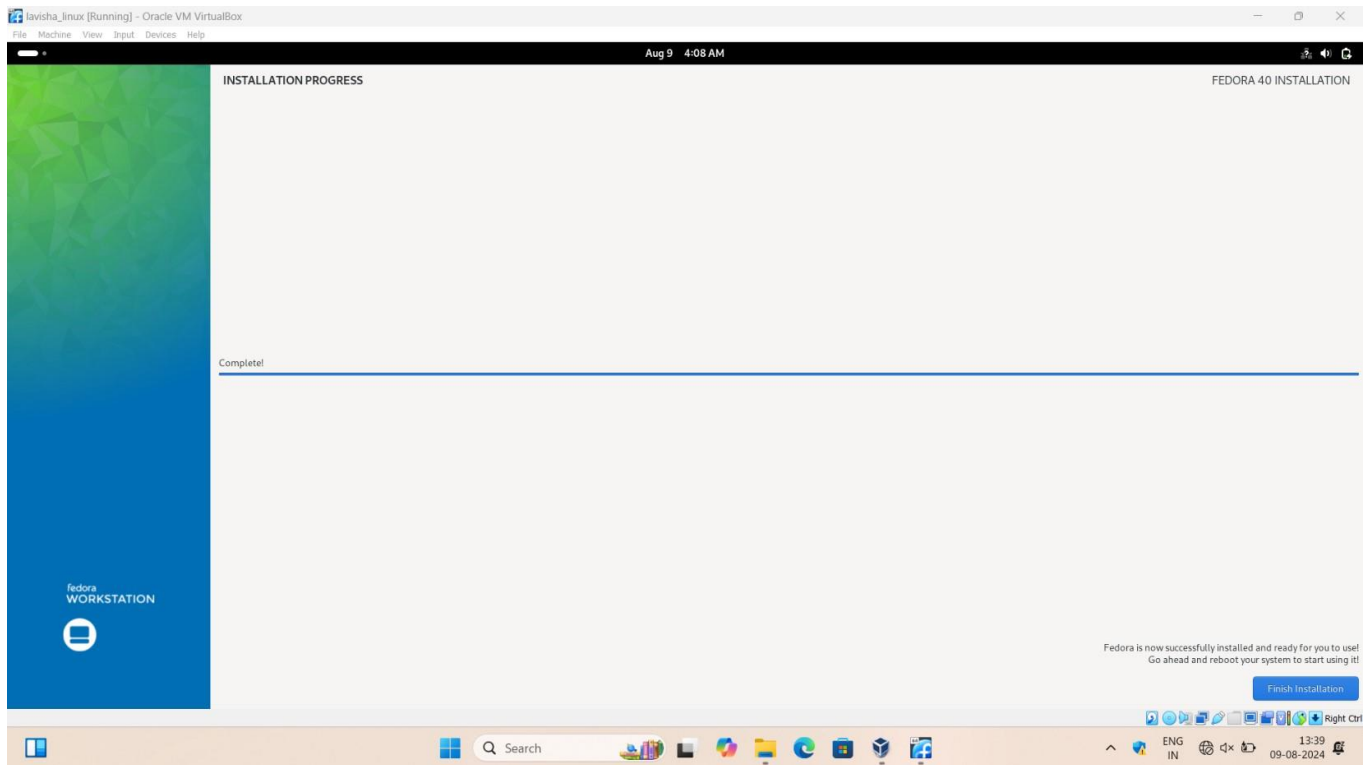

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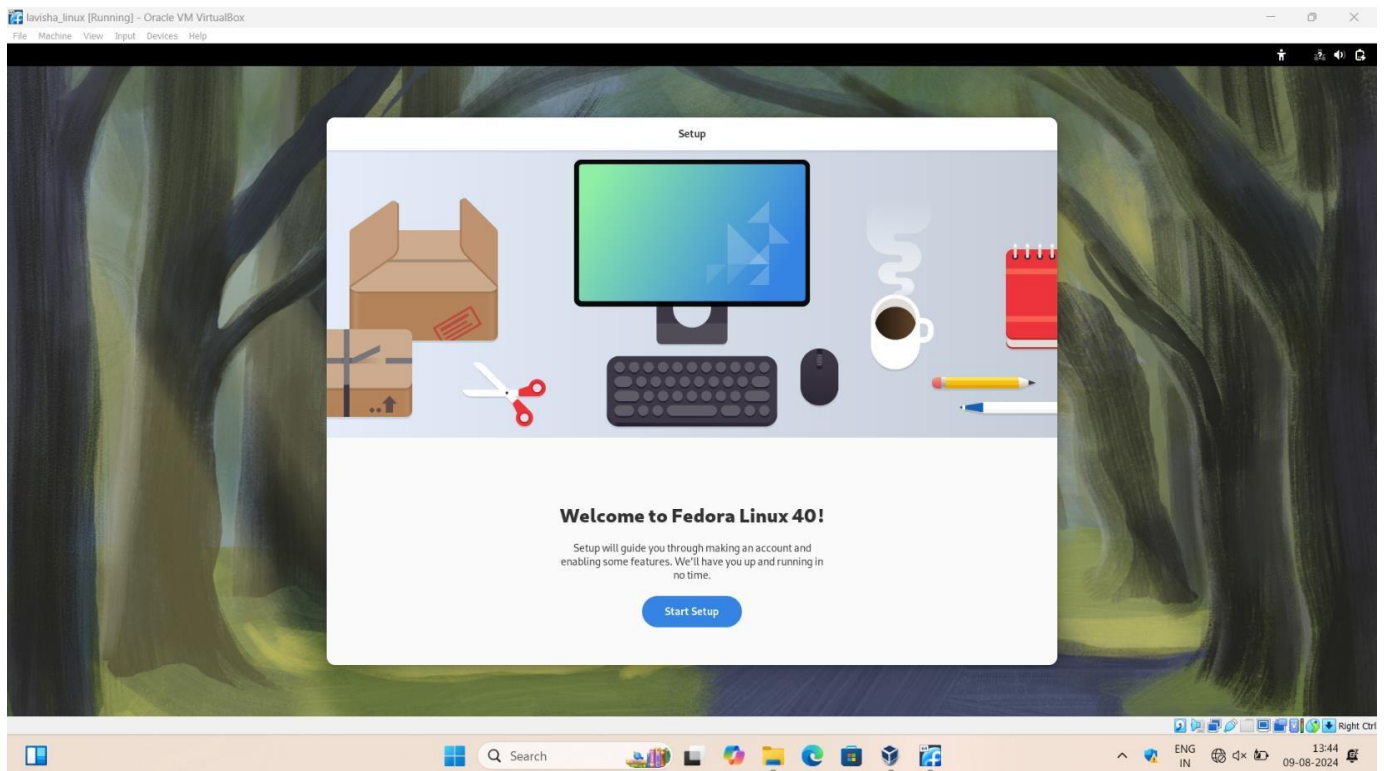Select the destiantion and configuration then click on done

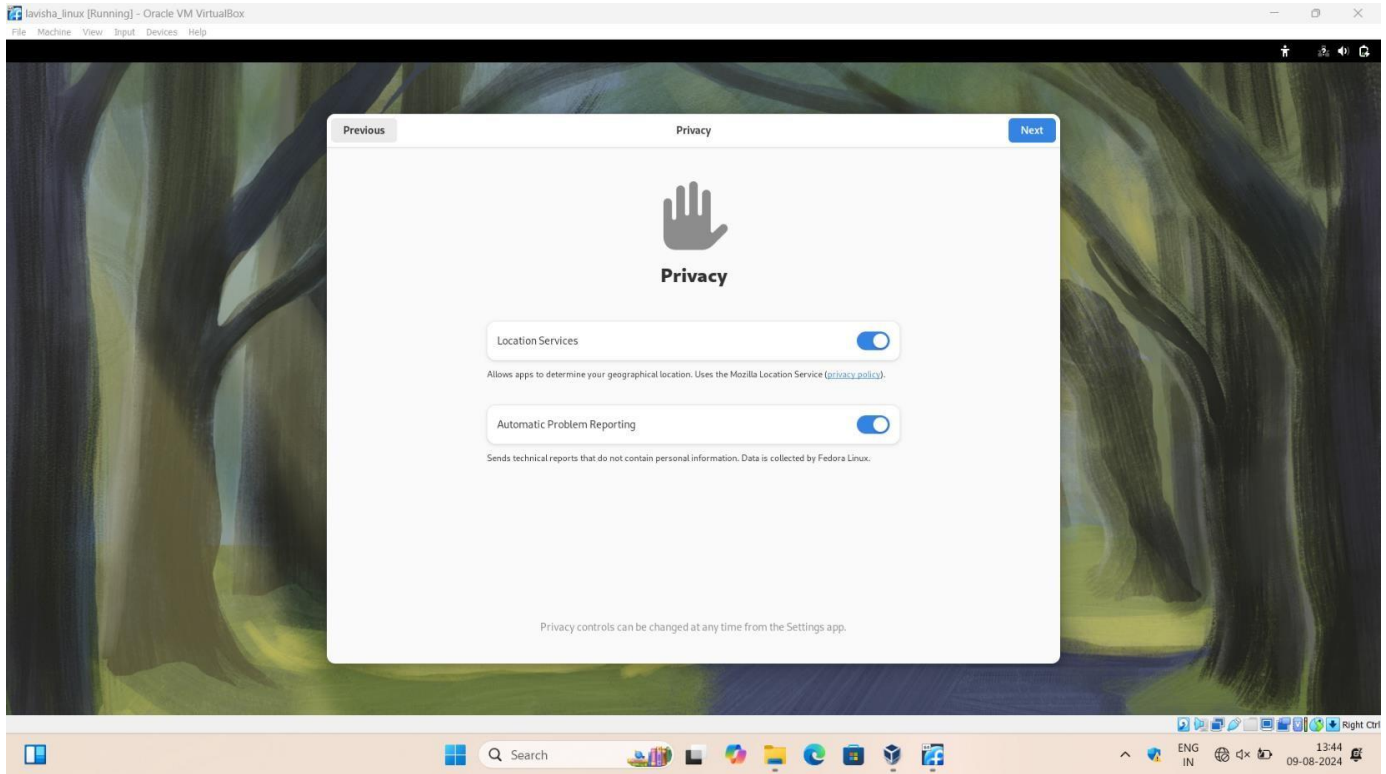Select the keyboard , date and time and click on BEGIN Installation

After installation progress completion click on Finish installation

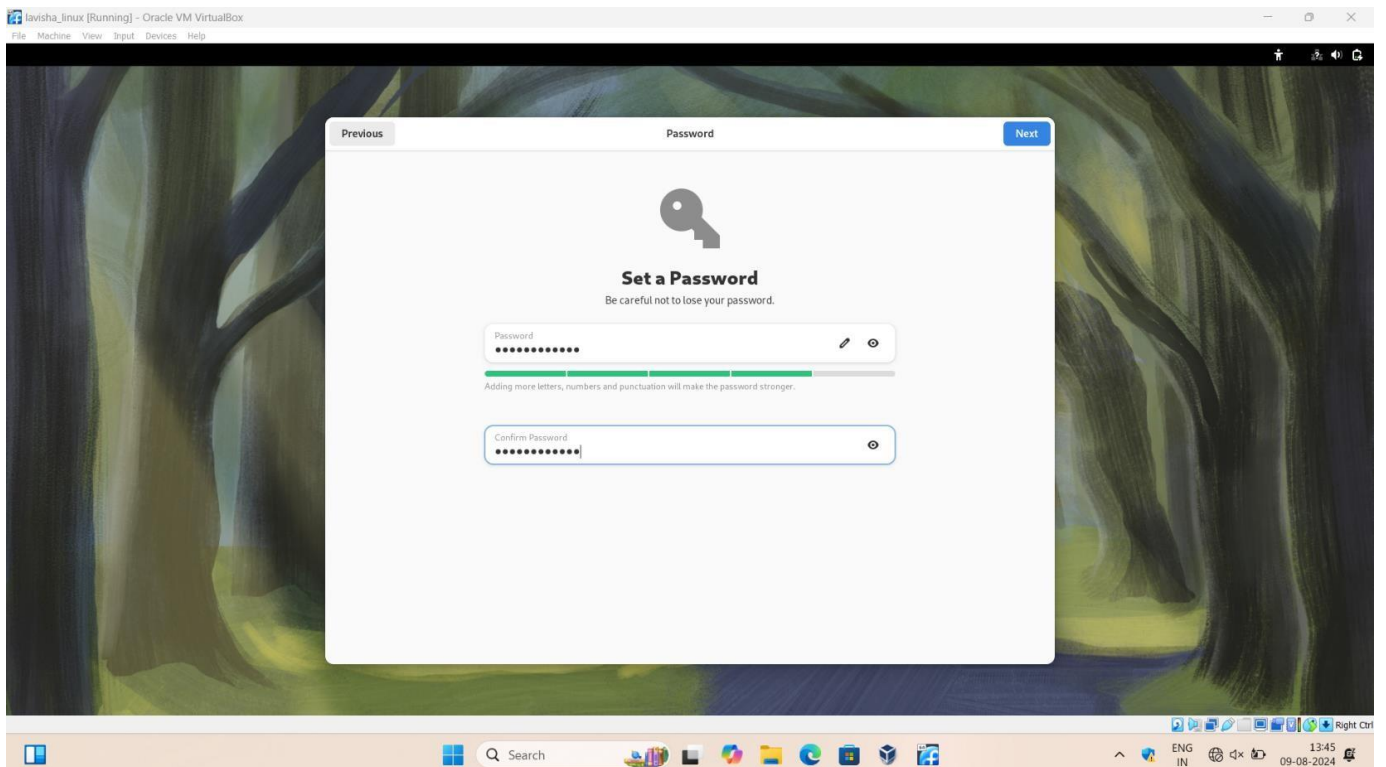

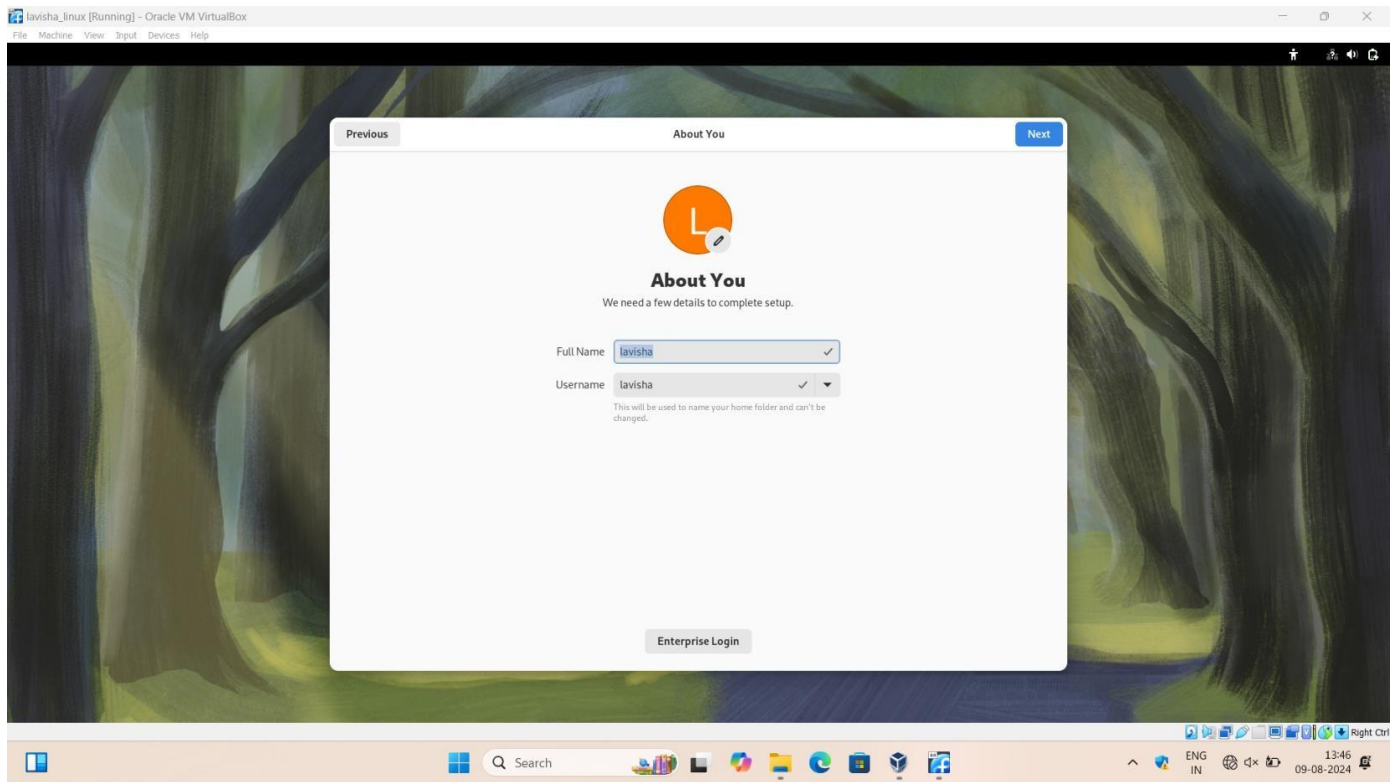Now Linux has intalled, click on start setup

Click on next

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Step 4: Set Up User and Password:

Enter a username and password
Create strong password and click on next
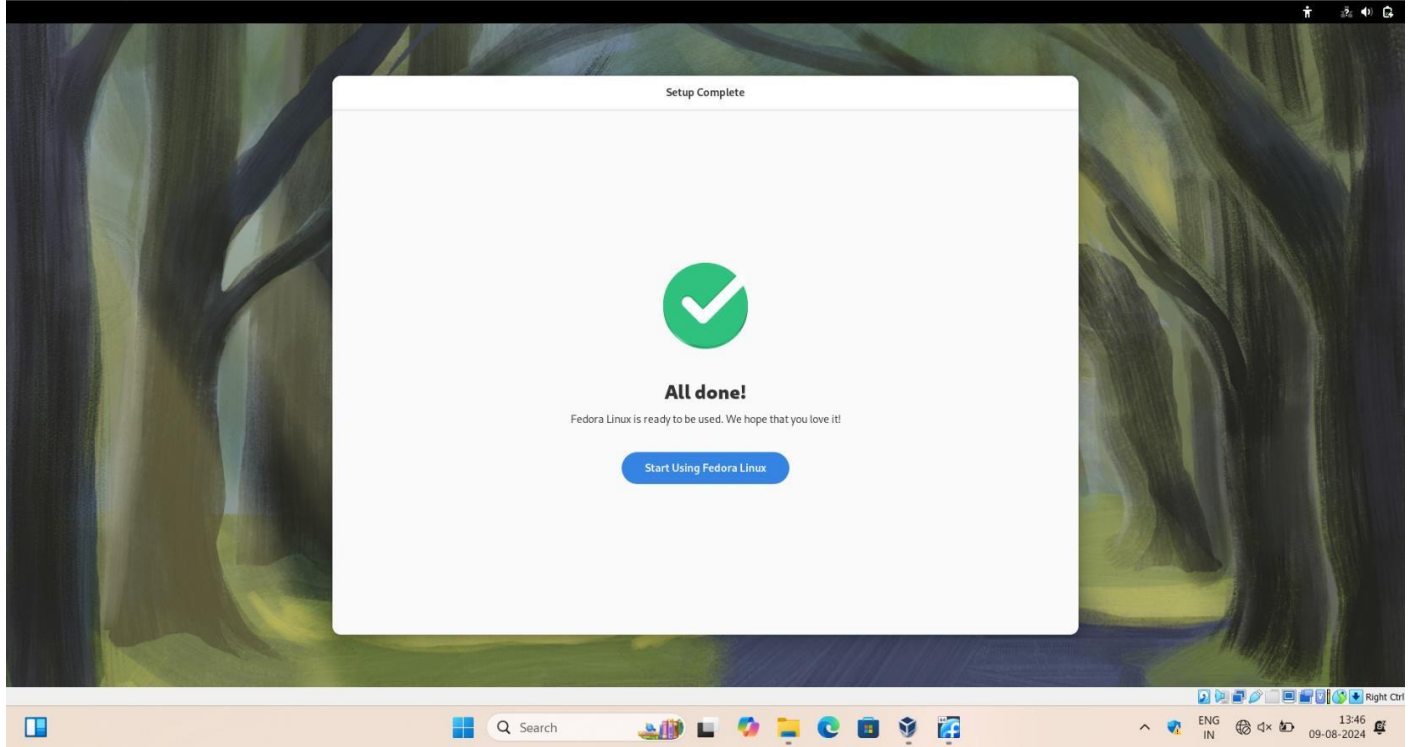
Write your full name and click on next

Step 5: Complete the Installation

1. Follow the on-screen instructions to complete the installation and reboot the system.
2. Once the complete process is finished successfully, It will automatically restart the virtual machine and will boot the Fedora Linux OS.
   Now setup is completed click on start using fedora Linux

Post-Installation Configuration (Optional)

Step 1: Install VirtualBox Guest Additions

VirtualBox Guest Additions improves performance and allows features like auto-resizing of windows and clipboard sharing between the host and guest OS.

1. Open the terminal in Fedora Linux and run the following command: **sudo apt update && sudo apt install -y virtualbox-guest-x11**

Step 2: Insert Guest Additions CD Image:

1. Go to Devices > Insert Guest Additions CD Image in VirtualBox.

Step 3: Run the Installation:

1. Mount the image and run the installer to enhance screen resolution and enable shared folders.

Conclusion

This project provided a comprehensive guide to installing and using Fedora Linux on VirtualBox in a Windows environment, enabling users to create a secure, flexible environment for cybersecurity tasks. We began by installing VirtualBox, a powerful open-source tool for virtualization, and setting up a virtual machine tailored for Fedora Linux. The step-by-step process covered essential tasks such as configuring system resources, installing the operating system, and integrating VirtualBox Guest
Additions to enhance usability through improved screen resolution and shared clipboard functionality.

By using virtualization, we can easily test and experiment with Fedora Linux, a leading penetration testing and security auditing platform, without risking damage to the host system. Additionally, we explored how to manage snapshots, enabling users to save the state of their virtual machine and quickly revert to previous configurations when needed.

Overall, running Fedora Linux in VirtualBox provides the benefits of isolation, portability, and ease of management, which are critical for both beginners and professionals in the cybersecurity field. Virtualization not only simplifies testing but also fosters a secure environment for conducting ethical hacking exercises, learning security techniques, and experimenting with various configurations.

References

1. VirtualBox Official Website – This is the official resource for downloading and learning about VirtualBox, a powerful open-source virtualization software. It includes detailed documentation, FAQs, and guides to help users understand and utilize VirtualBox effectively.

2. URL: https://www.virtualbox.org/

3. Fedora Linux Official Website – The go-to source for downloading Fedora Linux, this site provides essential information on the latest versions of the operating system, updates, and documentation. Fedora Linux is widely used by penetration testers and security professionals for its advanced toolset.

4. URL: https://fedoraproject.org/

5. Fedora Linux Documentation – This official documentation offers in-depth tutorials on installing, configuring, and using Fedora Linux. It is a helpful guide for both beginners and experienced users who want to make the most of Fedora extensive toolset for cybersecurity.

6. URL: https://docs.fedoraproject.org/en-US/docs/

7. VirtualBox User Manual – A comprehensive manual available from the VirtualBox website that details all the features and functions of the software, including how to create and manage virtual machines, install guest additions, and configure snapshots.

8. URL: https://www.virtualbox.org/manual/