PROJECT REPORT ON

"Introduction to Virtualization with VirtualBox in Linux"

Submitted By:

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Under The Guidance of:

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University Institute of Computing

Chandigarh University,

Mohali, Punjab

CERTIFICATE

This is to certify that Komal (UID- 24MCA20293) 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.

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 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.

Date: 24.10.2024

Place: Chandigarh University, Mohali, Punjab

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ABSTRACT

This project, "Introduction to Virtualization with VirtualBox in Linux," delves into the practical implementation and importance of virtualization using VirtualBox, an open-source platform developed by Oracle. Focusing on deploying CentOS as a guest OS within VirtualBox, the project aims to demonstrate the installation and configuration processes required to set up a virtual environment on a Linux host.

Key objectives include guiding users through the creation of virtual machines, managing system resources effectively, and leveraging essential VirtualBox features such as snapshot management, shared folders, and seamless mode for enhanced interaction between the host and guest OS. By simulating varied environments, the project showcases how developers and system administrators can optimize software performance, test multiple OS configurations, and deploy applications securely without needing separate physical machines.

Highlighting use cases in development, testing, and network security, the project emphasizes the significance of virtualization for secure, isolated, and scalable systems. Additionally, it underlines the role of virtualization in cloud computing, supporting developers with environments that are easily replicable and portable.

Through this project, participants gain a comprehensive understanding of how virtualization reduces hardware costs, improves efficiency, and streamlines software development processes, providing valuable insights into managing virtual environments in Linux-based settings.

Ultimately, this project reinforces the understanding that virtualization is not just a tool but a transformative technology that shapes modern computing practices. By employing VirtualBox alongside CentOS, users can experiment with powerful capabilities that boost system flexibility and foster innovation. The insights gained from this project empower developers, system administrators, and IT professionals to create efficient, secure, and scalable virtual environments that can adapt to a variety of real-world scenarios. This foundational knowledge supports enhanced software development, testing, and deployment workflows, making it an essential skill set in today’s tech-driven world.

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Introduction

This project, "Introduction to Virtualization with VirtualBox on Windows," highlights the significance of virtualization and provides a comprehensive guide to deploying CentOS as a guest OS within VirtualBox. Virtualization enables multiple operating systems to run concurrently on a single physical machine, enhancing flexibility and optimizing resource use. This project covers the installation of VirtualBox on a Windows host, the configuration of virtual machines, and the deployment of CentOS, emphasizing practical benefits such as isolated testing environments, safer experimentation, and efficient resource management.

Users will gain hands-on experience in setting up VirtualBox, creating VMs, and managing resources effectively. The project also explores the use of key features like VM snapshots for state management and network configuration for enabling guest OS communication with external networks. These skills are crucial for developers and IT professionals who require reliable environments for testing software or deploying applications without affecting the host system's stability.

Additionally, the project delves into how virtualization supports broader IT operations, such as cloud computing and data center management, providing a strong foundation for understanding Infrastructure as a Service (IaaS). By mastering these concepts and practices, users can enhance their technical skills and prepare for the evolving demands of modern computing, applying virtualization solutions effectively in development, testing, and IT management scenarios.

1. Objective

The primary objective is to demonstrate how to set up and configure VirtualBox on a Windows host system, install CentOS as the guest OS, and explore the advantages of using virtualization for development, testing, and application deployment. The project will cover the step-by-step process of VM creation, resource allocation, and effective management practices for running CentOS in a virtualized environment.

1.2 Background

Virtualization has become a pivotal technology in modern IT infrastructures due to its ability to abstract hardware resources and create isolated, independent environments. This is critical for server consolidation, development, testing environments, and resource management in cloud computing. VirtualBox provides an accessible platform to practice these concepts with support for Linux, Windows, macOS, and more. Users can leverage its features to run multiple guest OSs simultaneously, enabling efficient multi-tasking and testing without impacting the host system.

System 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 optimal performance).
- **Hard Disk Space**: At least 30 MB for VirtualBox installation, with 20 GB or more per VM recommended.
- **Graphics**: Support for hardware virtualization, beneficial for 3D acceleration (optional).

2. **Guest Operating System Requirements:**

- **Guest OS**: This project will focus on CentOS, but VirtualBox supports various other Linux distributions, Windows versions, and more.
- **RAM for Guest OS**: Allocate at least 2 GB of RAM for CentOS to ensure smooth operation.
- **Disk Space for Guest OS**: Ensure adequate space for CentOS installation, typically at least 20 GB.

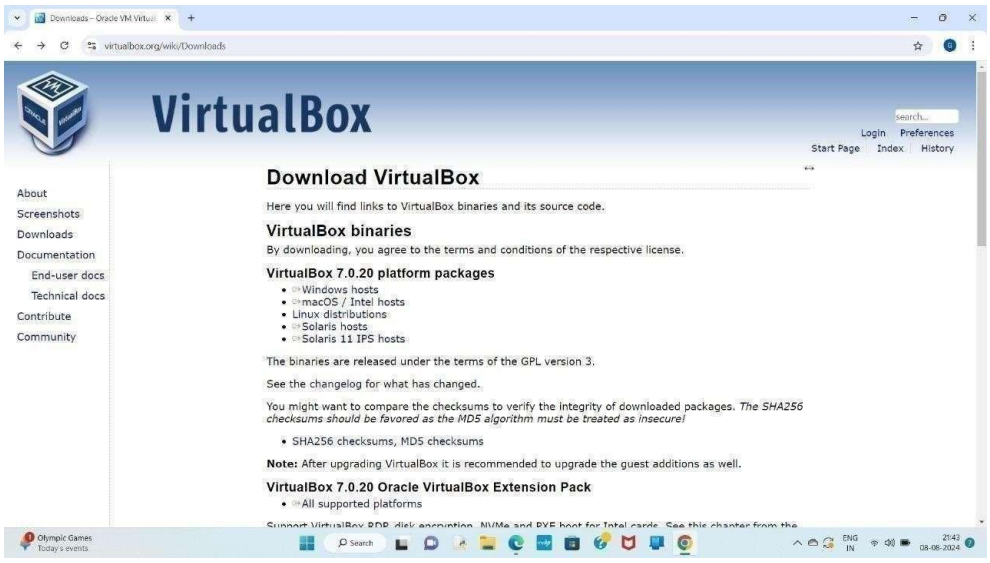
3. **Software and Additional Requirements:**

- **Admin Rights**: Required for installing VirtualBox and configuring VMs.
- **Internet Connection**: Recommended for downloading VirtualBox and CentOS installation files.

Download and Install VirtualBox on Windows

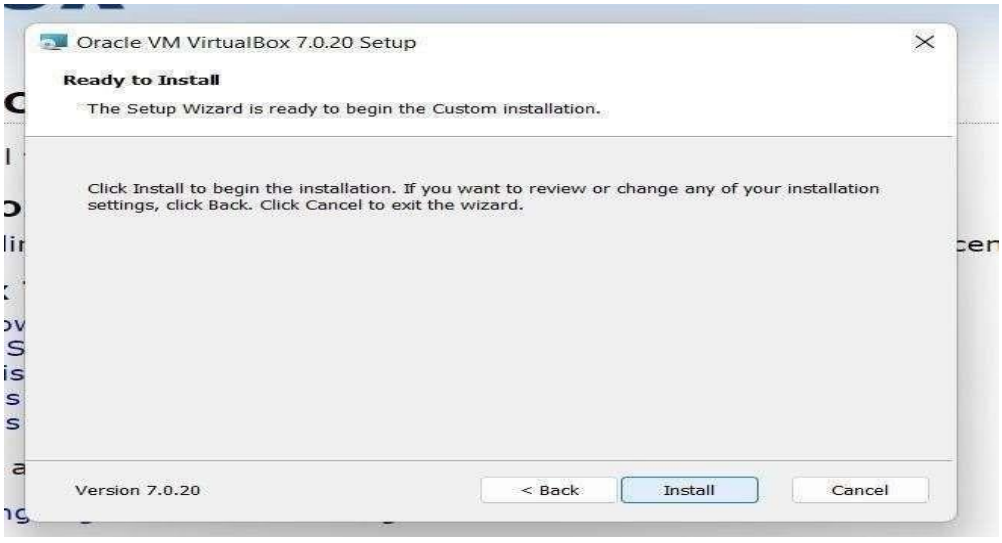
Step 1: Download VirtualBox

1. Go to the VirtualBox website and download the latest version of VirtualBox for Windows.



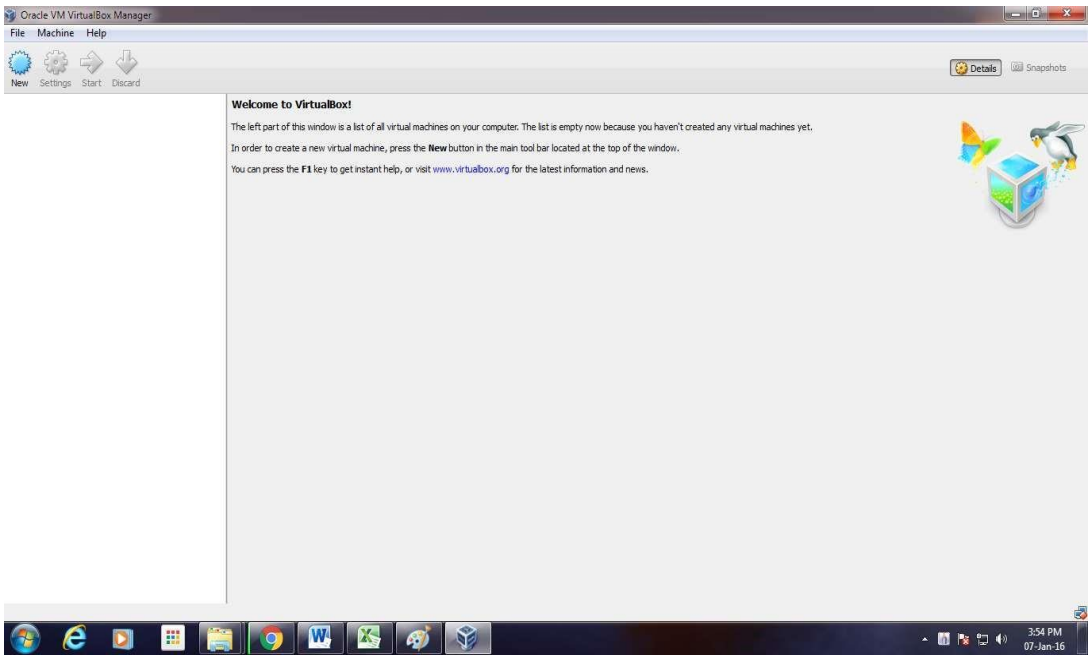
Step 2: Install VirtualBox

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.



Step 3: Launch VirtualBox

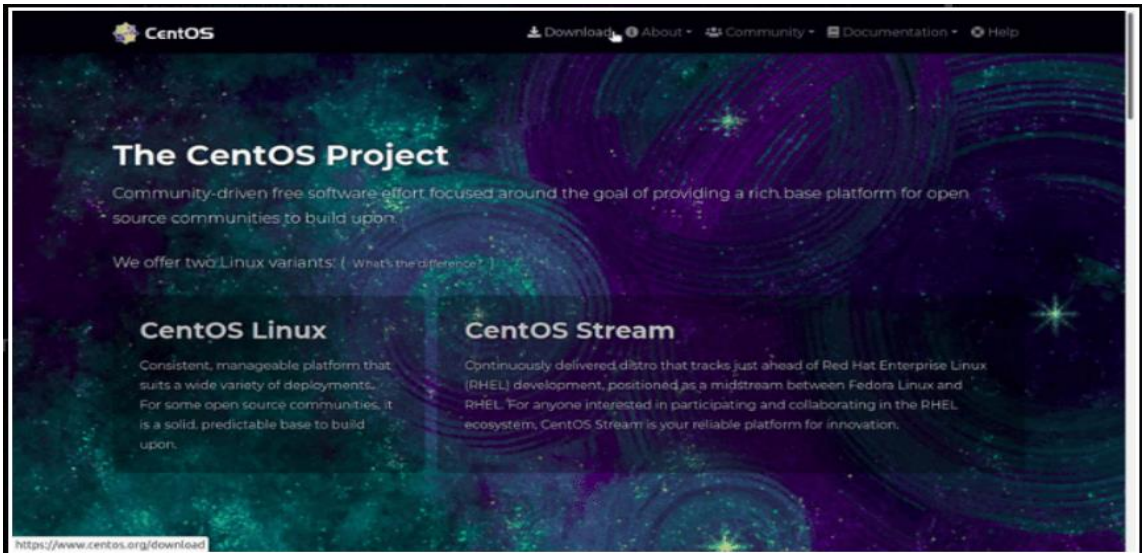
After the installation, VirtualBox will automatically launch. You'll see the main VirtualBox interface.



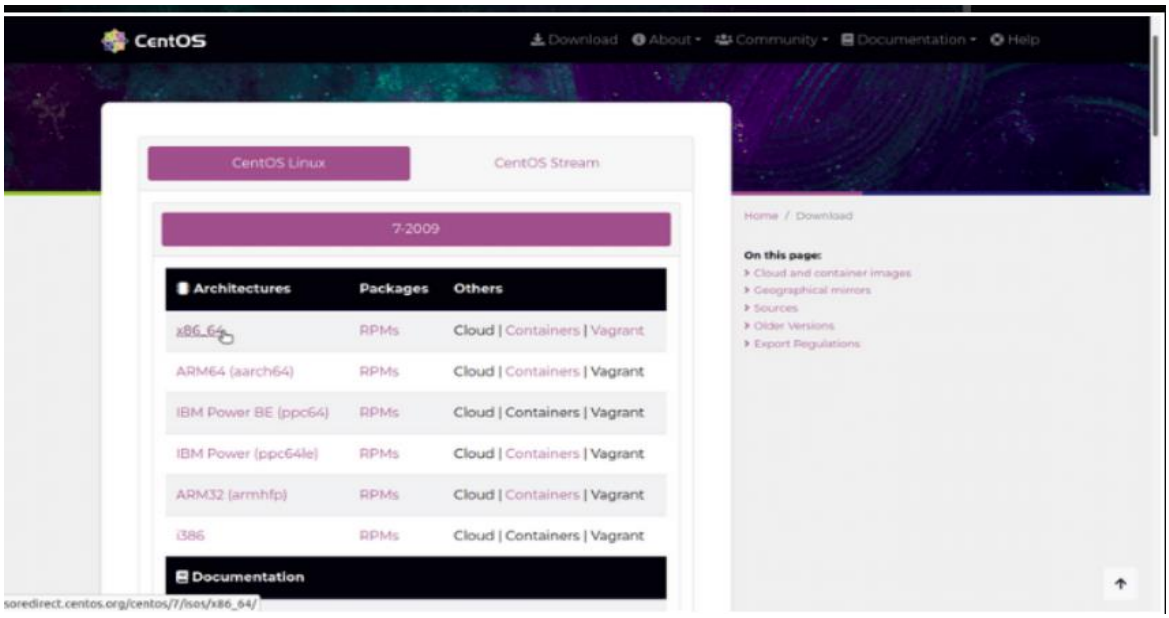
Download CentOS ISO File

Before we begin the installation process, we need to download the ISO file for CentOS

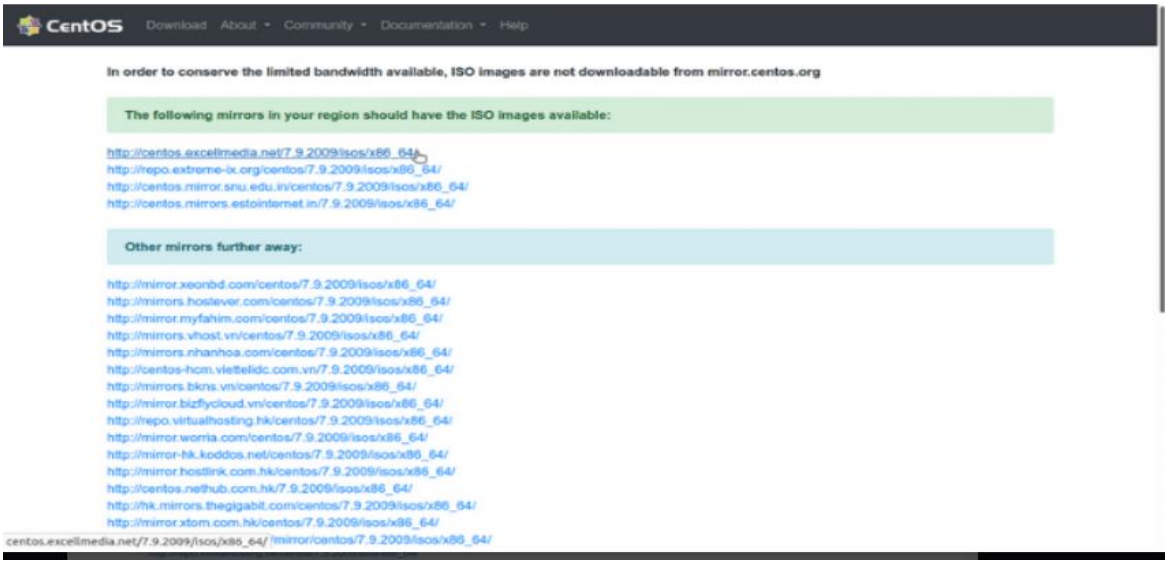
Step 1: Go to the CentOS website and go to the downloads tab.



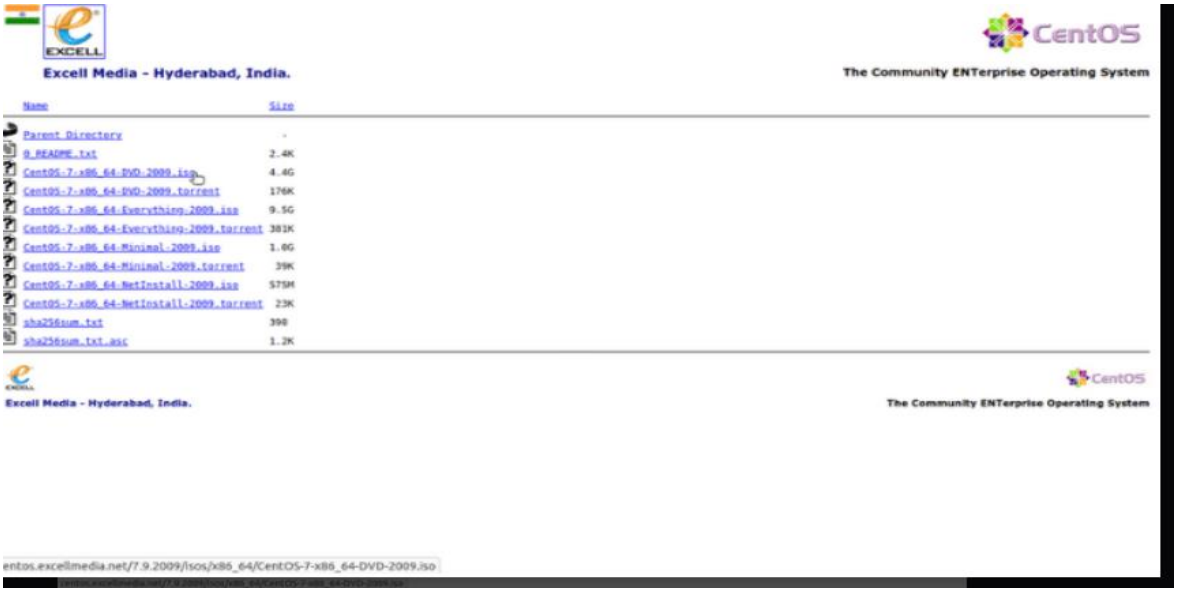
Step 2: Click on the correct ISO file for your system architecture (most likely x86_64 for modern systems).



Step 3: Choose a mirror to download the ISO from (preferably from mirrors in your region for better download speeds).



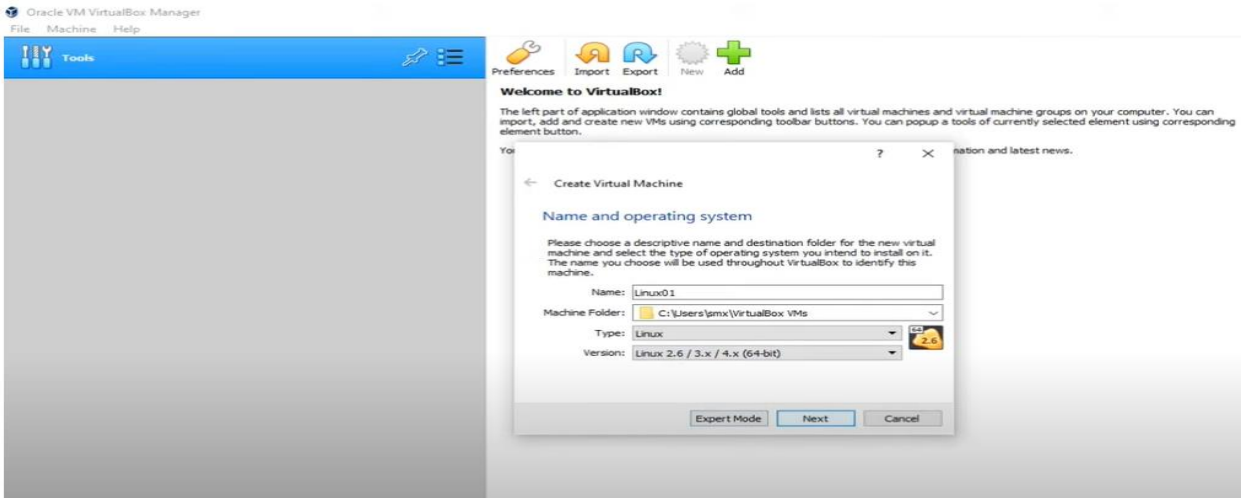
Step 4: Download the version that says DVD-2009.iso



Create a New Virtual Machine in VirtualBox for CentOS Step 1:

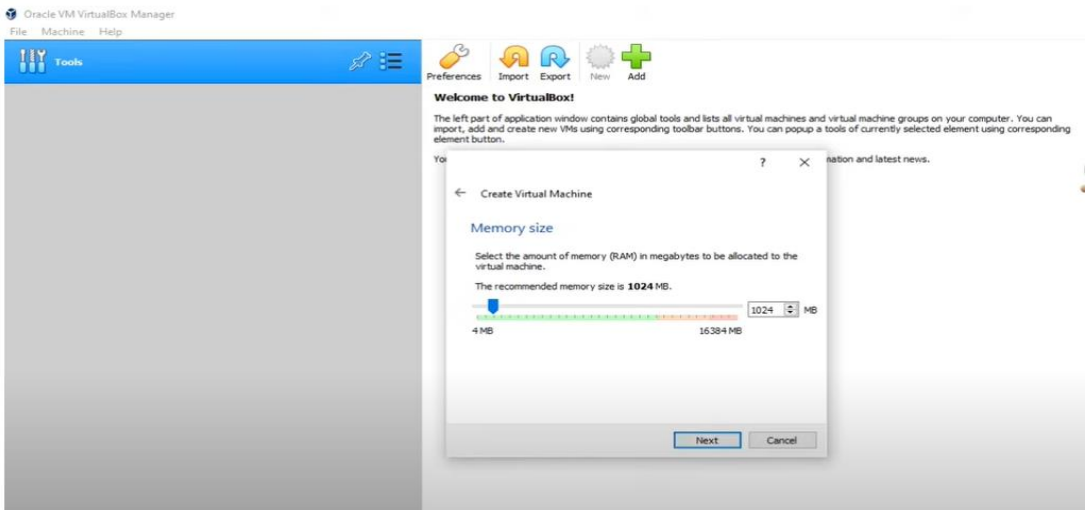
Open VirtualBox and Create a VM

1. In VirtualBox, click the New button to create a new virtual machine.
2. In the Name field, enter "CentOS 7 VM" or any name of your choice.
3. Under Type, select Linux, and under Version, select CentOS (64-bit).
4. Click Next.



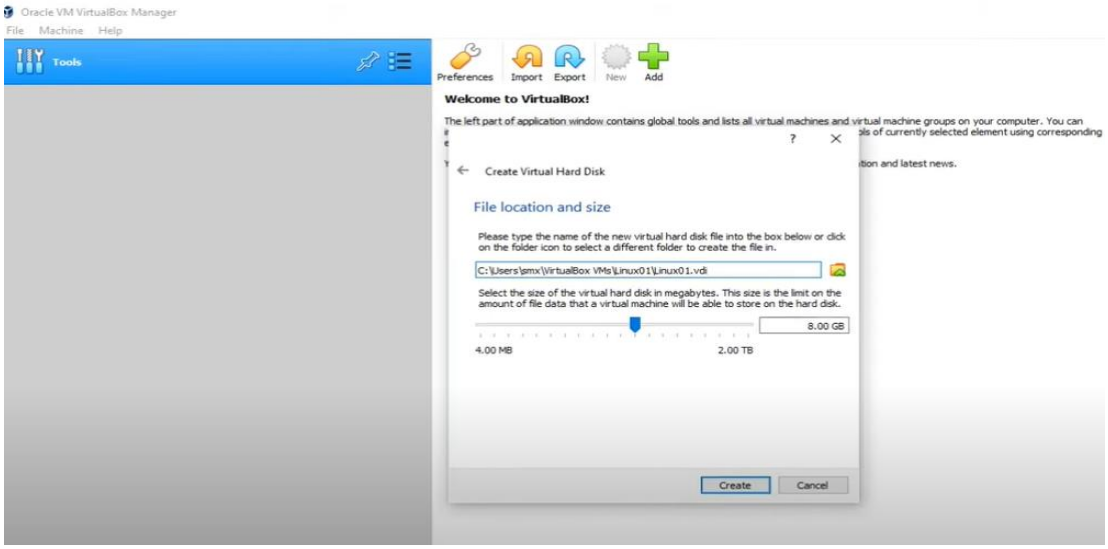
Step 2: Allocate RAM for the VM

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



Step 3: Create a Virtual Hard Disk

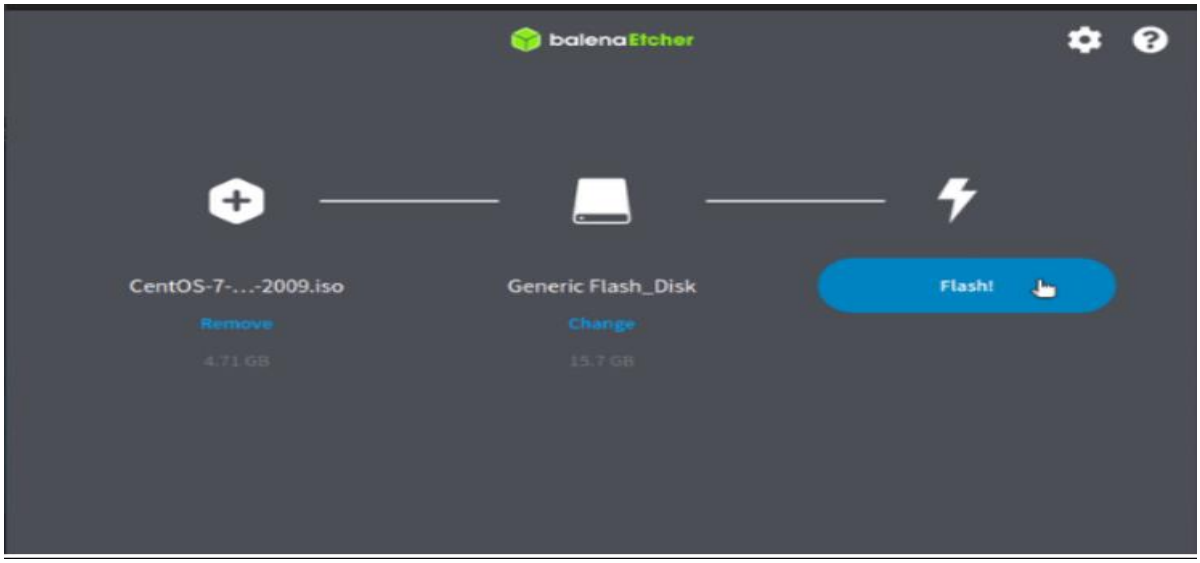
1. Choose Create a virtual hard disk now and click Create.
2. Select the VDI (VirtualBox Disk Image) format and click Next.
3. Select Dynamically allocated (this saves disk space).
4. Set the disk size to at least 20 GB (or more if you want), and click Create.



Preparing a bootable USB

Step 1: create a bootable USB, burn it on a DVD or load the image on a VM**.**

Step 2: Use a tool like an etcher or UNetbootin, etc to flash the drive.



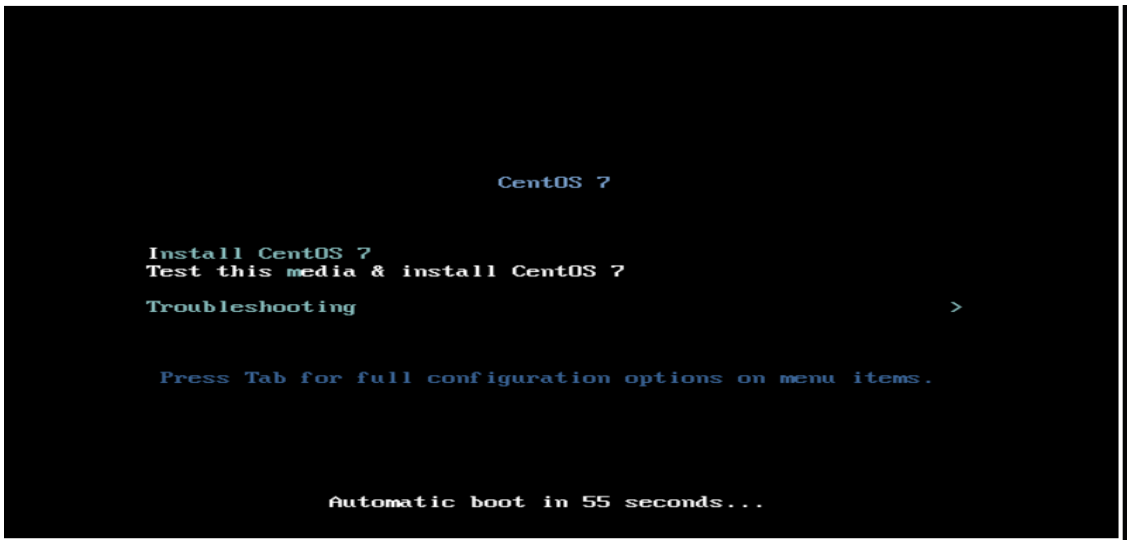
The setup is intuitive and easy:

1. Select the CentOS 7 ISO image.
2. Insert the USB flash.
3. Find the USB and select it in the *Select drive* step.
4. Click Flash.

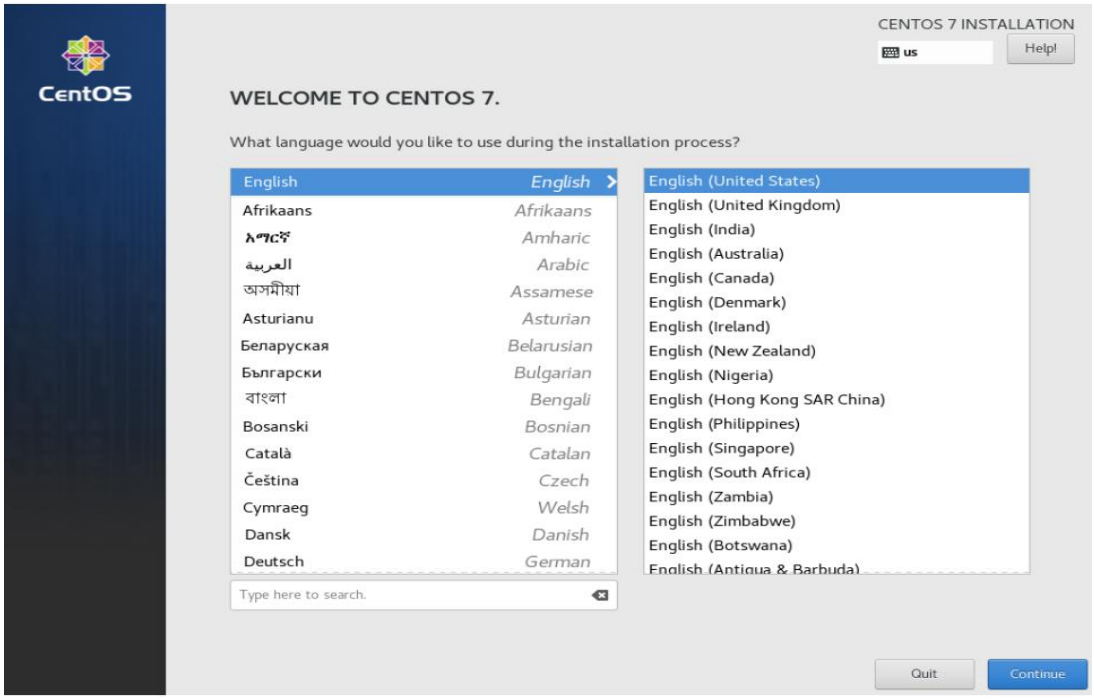
Note: To enter the BIOS a special hotkey is required, this key can differ from manufacturer to manufacturer and model to model. For example, the hp laptop uses F10 and ESC keys as its primary hotkeys for the step.

Final setup:

Step 1: Click on the option "**Install CentOS 7**" and wait till Graphical Interface appears.

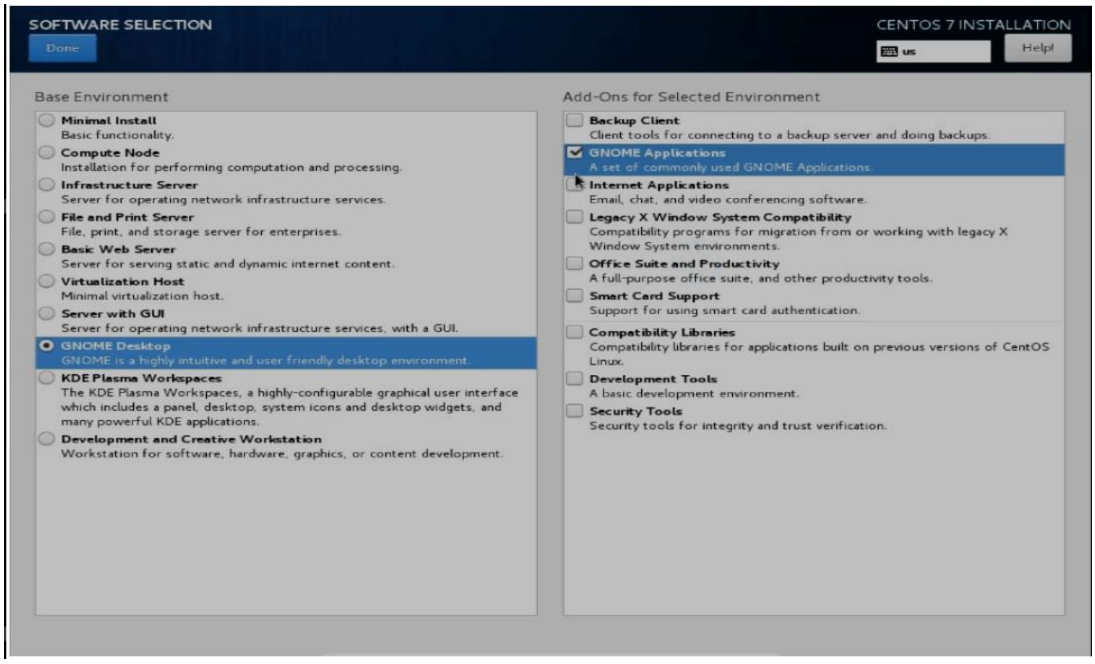


Step 2: Choose your installation language. Here, we have chosen English.

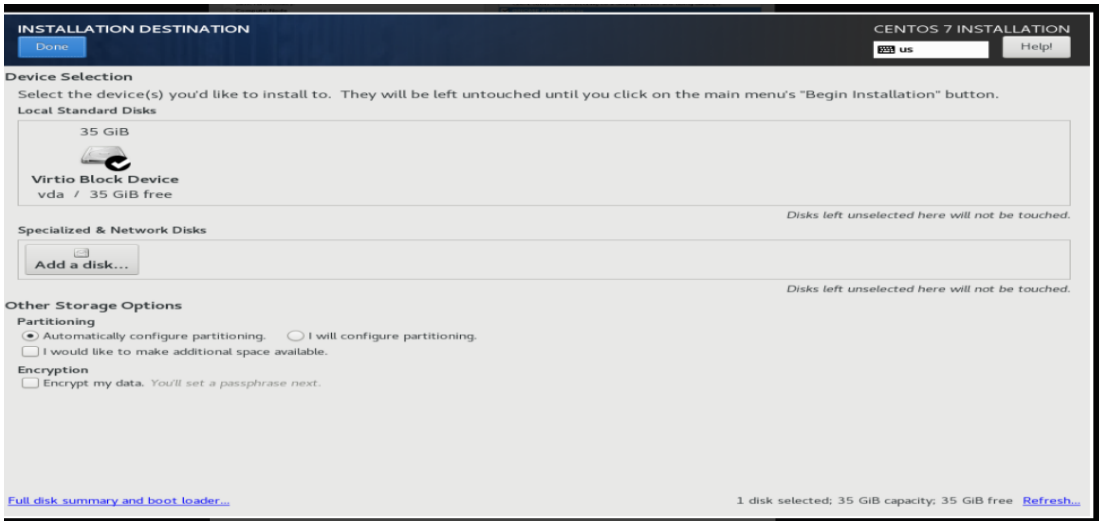


Step 3: Configure options such as date and time, network configuration, etc.

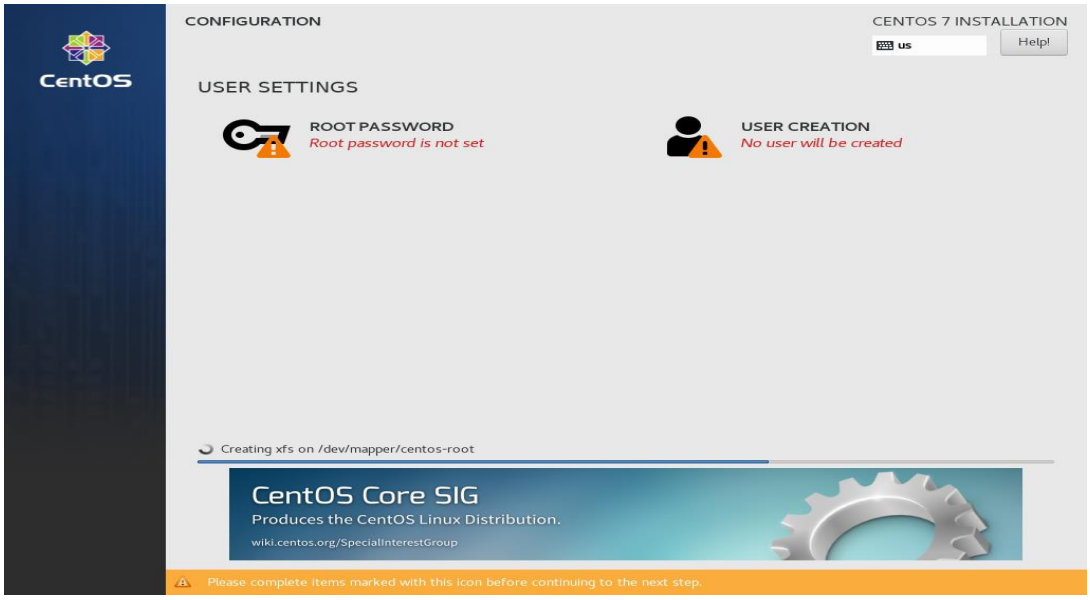
Step 4: Choose the software to be installed depending on the use case and familiarity with the desktop.



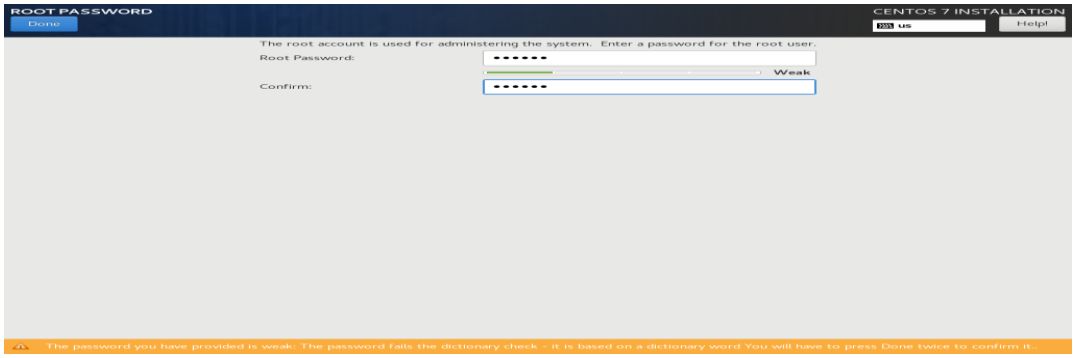
Step 5: Choose the disk where the distribution should be installed.



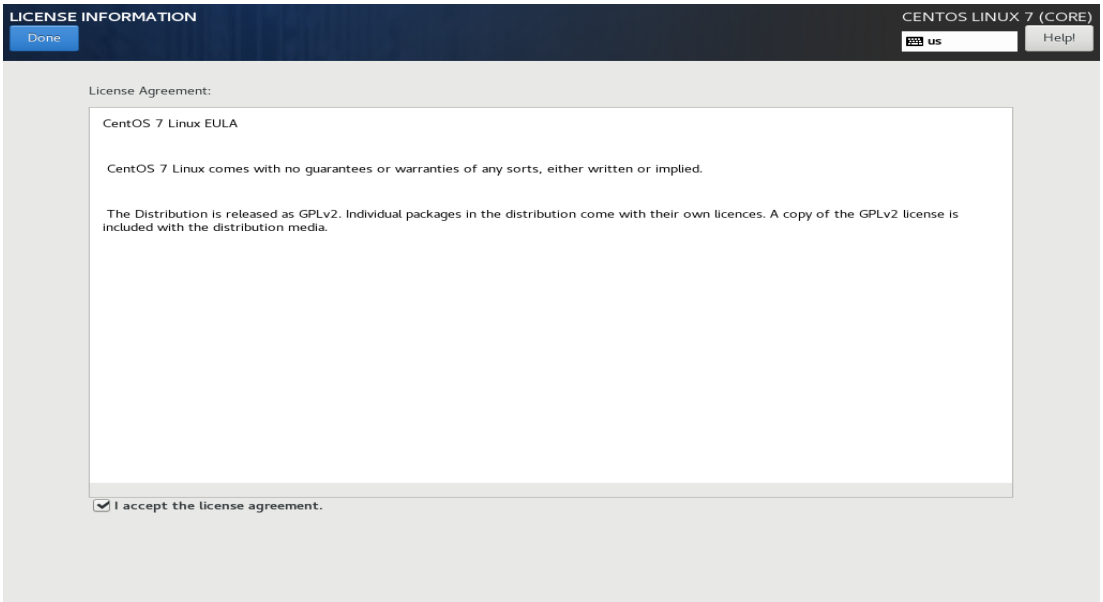
Step 6: Our Installation process has been started successfully.



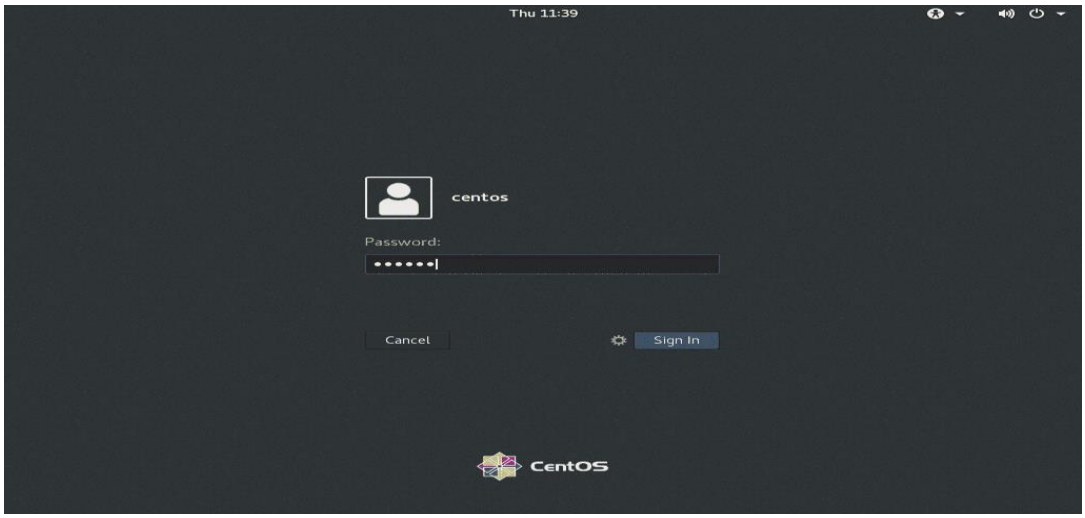
Step 7: Now, set up a root password and user account in the meanwhile.



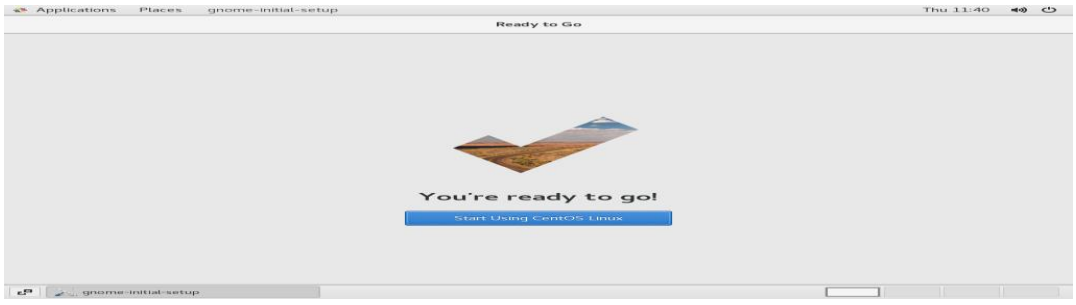
Step 8: After installation is completed successfully, reboot and accept the license agreement.



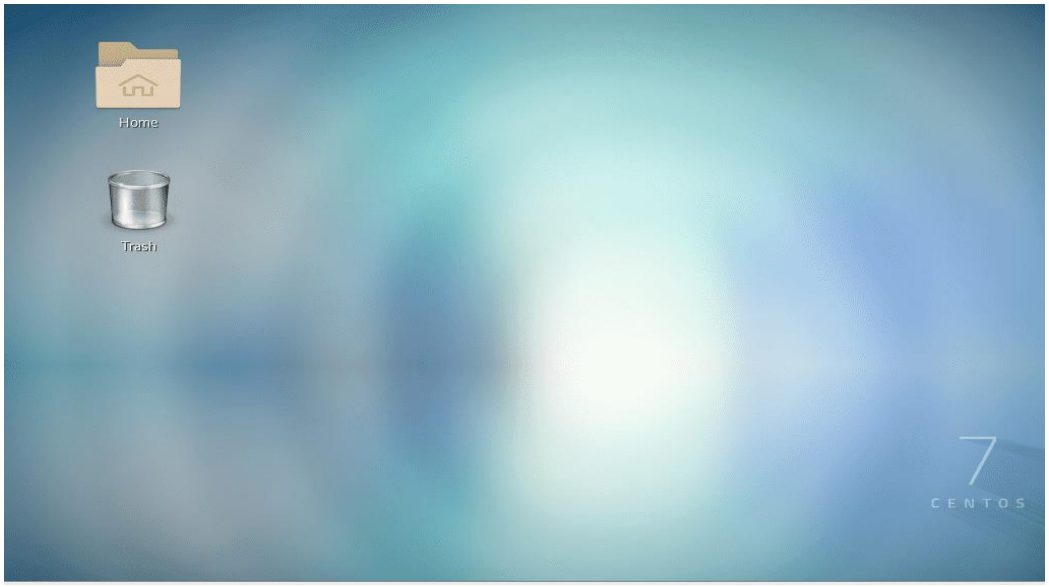
Step 9: Now, log in to the system using the credentials created in **Step 6.**



Step 10: Complete the initial setup and the system is ready for use.

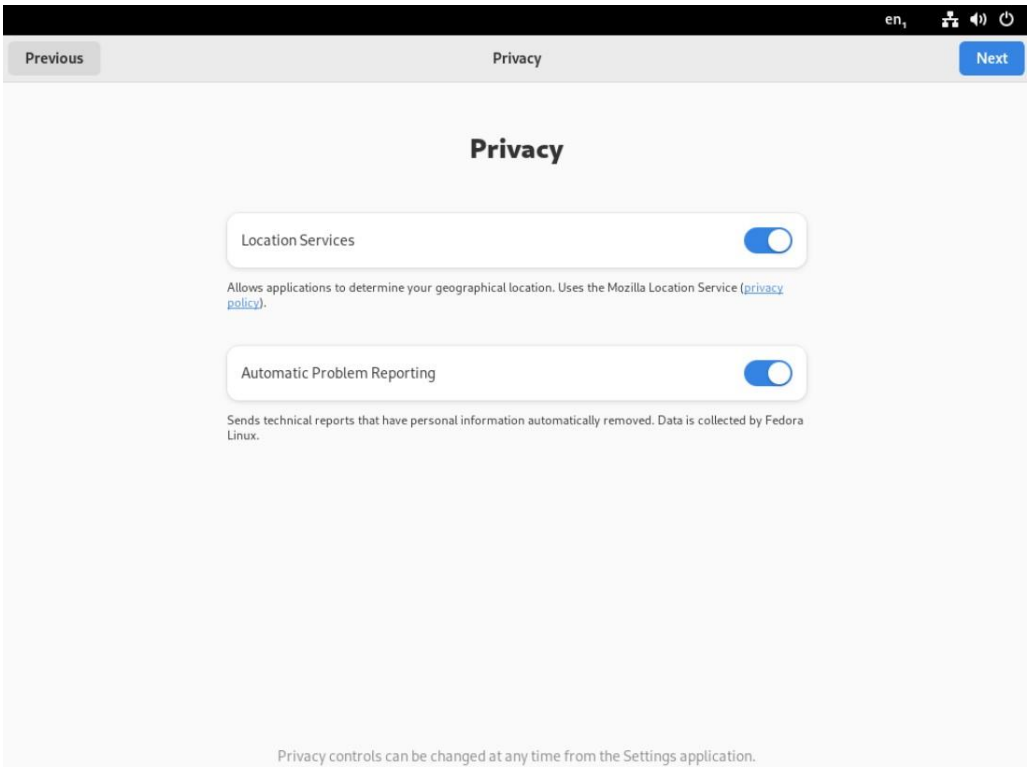


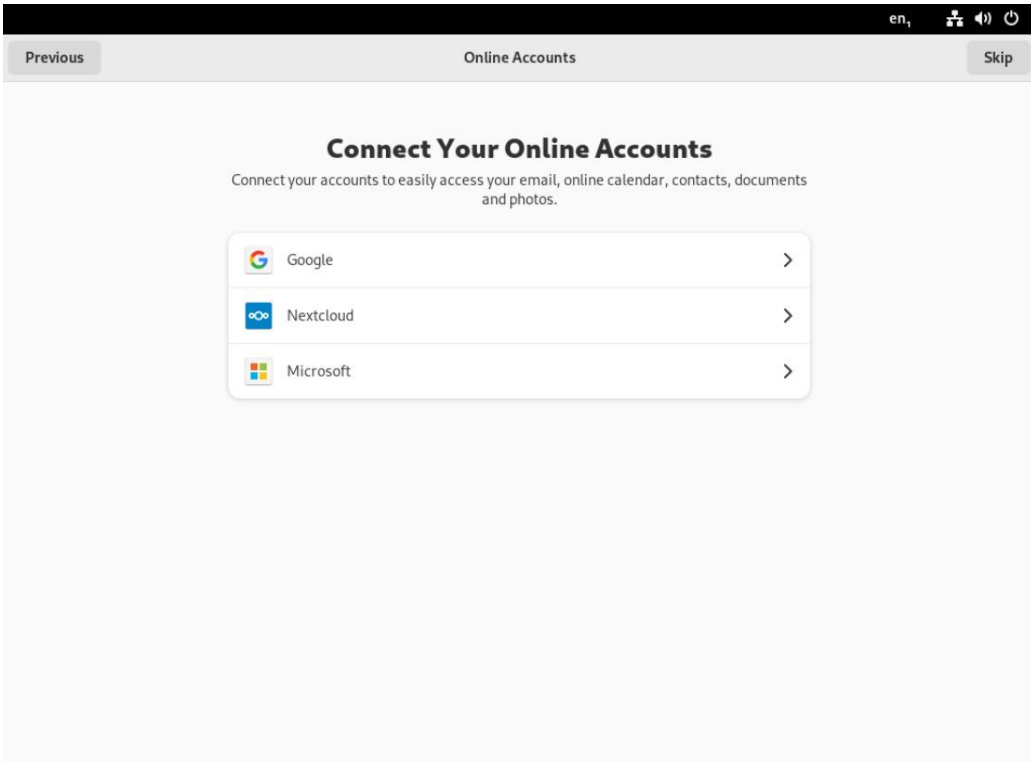
Step 11: We have successfully completed the installation process of CentOS.



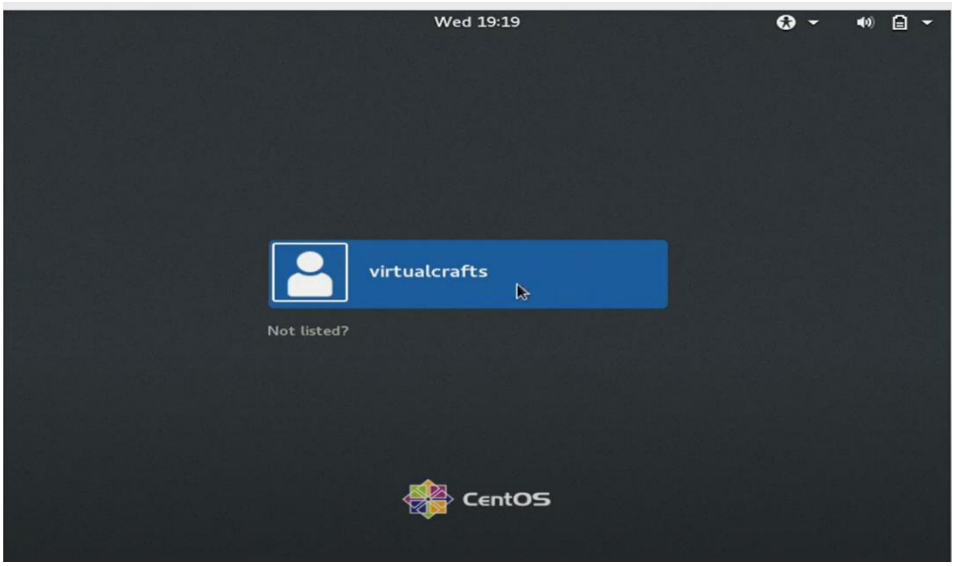
After Installation CentOS

In the next screen, you will have the options to configure privacy related settings like enable location services and automatic error reporting. Toggle the ON/OFF switch to enable or disable these services. By default, both will be set to ON.

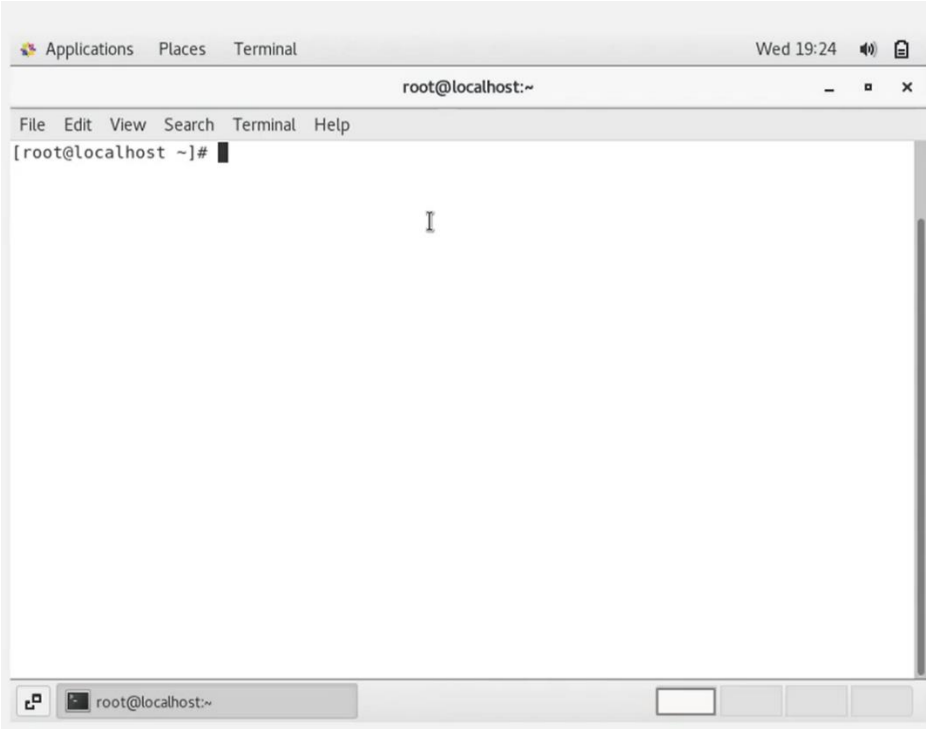




Login with user's name and its password you created during the installation.



You can now use the Linux OS on your Windows machine using VirtualBox.



Conclusion

In conclusion, the "Introduction to Virtualization with VirtualBox on Windows" project underscores the transformative power of virtualization in modern computing. By guiding users through the process of setting up VirtualBox, creating and managing VMs, and deploying CentOS as a guest OS, this project provides practical knowledge and technical skills essential for developers, IT professionals, and system administrators.

The project demonstrates how virtualization enables safer experimentation, efficient resource management, and isolated testing environments, all of which are crucial for optimizing software development and deployment workflows. Additionally, understanding and mastering these virtualization practices lay a strong foundation for further exploration into cloud computing and scalable IT solutions. Overall, this project equips users to confidently leverage virtualization to meet contemporary and future technological challenges.

In addition to the hands-on experience provided, this project highlights the broader implications of virtualization in IT operations. Virtualization technologies such as VirtualBox play a significant role in enabling businesses to streamline their development and testing processes without the need for additional physical hardware.

By using a virtualized CentOS environment, users can simulate production-level configurations and scenarios, leading to better software reliability and faster iteration cycles. This contributes to cost savings, improved system flexibility, and more efficient use of resources, which are critical factors for businesses seeking to enhance their IT infrastructure.

References

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