



BAHIR DAR UNIVERSITY (BIT) FACULTY OF COMPUTER SCIENCE

DEPARTMENT OF INFORMATION SYSTEM

COURSE: OPERATING SYSTEM FIRST INSTALLATION OF OPERATING SYSTEM
PROJECT

Name ID

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Submitted to:- Mr. Lec WENDMU

1. Introduction

1.1 Background

In the modern world, computers and digital systems play an essential role in everyday life. People use computers, mobile phones, and online services for communication, education, business, and entertainment. At the center of all these systems is the operating system, which controls the hardware, manages system resources, runs applications, and allows users to interact with the computer. Without an operating system, a computer cannot function effectively.

As technology continues to advance, especially in areas such as enterprise computing, cloud services, and large-scale data management, the demand for reliable and efficient server operating systems has increased. Server operating systems are designed to handle continuous workloads, support multiple users, and provide high performance and security. For these reasons, many organizations rely on Linux-based operating systems, which are known for their stability, flexibility, security, and cost-effectiveness. Linux systems are commonly used to run critical services such as web servers, database servers, and virtualization platforms.

Oracle Linux Server is one of the enterprise-level Linux operating systems used in such environments. It is developed and maintained by Oracle Corporation and is fully compatible with Red Hat Enterprise Linux (RHEL). Oracle Linux is designed for long-term use, high performance, and strong security, making it suitable for data centers, cloud infrastructures, and enterprise systems. It is especially popular in organizations that use Oracle databases and enterprise applications, where reliability and performance are critical.

In educational and learning environments, installing operating systems directly on physical computers is often not practical. This can be due to limited hardware resources, shared systems, or the risk of damaging existing installations. To address this challenge, virtualization technology is widely used. Virtualization allows multiple operating systems to run on a single physical computer by creating virtual machines that simulate real hardware.

Tools such as Oracle VM VirtualBox provide a safe and flexible platform for installing and testing operating systems in a controlled environment. By using virtualization, students can gain hands-on experience with server operating systems like Oracle Linux Server without affecting the host operating system. This approach supports practical learning, improves technical skills, and helps prepare learners for real-world roles in system administration and information systems.

1.2 Motivation

Company Background and Motivation

Oracle Corporation is a major global technology company founded in 1977 in California by Larry Ellison, Bob Miner, and Ed Oates. It started as a database software company and became famous for developing one of the first commercially successful relational database management systems (RDBMS) using SQL, which revolutionized how data is stored and managed. Over the years, Oracle expanded its products into areas such as cloud computing, business applications, middleware, storage systems, and operating systems. Today, Oracle's products are used by organizations worldwide in industries like finance, telecommunications, government, healthcare, and more.

Oracle Linux is a Linux distribution that Oracle first released in 2006. It was created by packaging and building a stable, enterprise-ready operating system based on Red Hat Enterprise Linux (also known as RHEL). The main company motivation for launching Oracle Linux was to

provide a free, reliable, and enterprise-grade Linux platform that could support Oracle applications, databases, and cloud services on a powerful, secure operating system.

On a personal and academic level, this project is motivated by my interest in understanding how real enterprise operating systems work beyond basic computer use. Most people, including me, interact with computers at a surface level — opening applications, browsing the internet, or using mobile apps — without knowing how the core system controls all underlying functions. This curiosity brought me to explore a server-grade operating system like Oracle Linux Server

Key motivations behind Oracle Linux from the company's perspective include:

- To develop a Linux distribution optimized for enterprise workloads, including Oracle Database and other mission-critical applications.
- To offer a high-performance and secure server platform that can run in data centers, cloud environments, and virtualized infrastructures.
- To enable customers to use Linux without high licensing costs, while providing optional paid support services for enterprise business needs.
- To include advanced features such as improved performance kernels and zero-downtime patching tools (like Ksplice) for systems that must remain available without interruption.
- To support cloud computing environments, automation, containerization, and modern virtualization technologies as part of an integrated enterprise ecosystem.

2 objective

The main objective of this project is to move beyond theoretical knowledge and gain a real understanding of how an operating system works in practice

- ❖ To understand how operating systems are installed using virtual machines instead of physical hardware.
- ❖ To apply theoretical operating system concepts such as the boot process, disk partitioning, and file system selection in a real installation environment.
- ❖ To gain hands-on experience in installing an enterprise operating system safely without affecting the host computer.
- ❖ To develop troubleshooting skills by identifying and solving common installation and configuration problems.
- ❖ To experiment with operating system resource management, including memory allocation, CPU usage, and storage configuration.
 - ❖ To understand virtualization technology, how hypervisors work, and why virtualization is important in modern computing.
 - ❖ To prepare for real-world system administration tasks where virtual machines are commonly used.

3. Requirements

Before installing Oracle Linux Server in a virtual environment, it is very important to identify and prepare the required hardware and software resources. Proper planning of requirements helps to avoid installation errors, performance issues, and system failures. Since this project uses virtualization technology, both the physical computer (host system) and the virtual machine must meet certain

minimum and recommended requirements.

3.1 Hardware Requirements

The hardware requirements refer to the physical computer (host machine) on which the virtual machine will run. Even though Oracle Linux Server is installed virtually, it still consumes real hardware resources such as CPU, memory, and storage.

3.1.1 Host Machine Requirements

Processor (CPU):

A 64-bit processor with virtualization support (Intel VT-x or AMD-V) is required. Most modern processors support virtualization.

- Minimum: Dual-core processor
- Recommended: Quad-core processor or higher

Random Access Memory (RAM):

Sufficient RAM is necessary to run both the host operating system and the virtual machine smoothly.

- Minimum: 4 GB RAM
- Recommended: 8 GB RAM or more

Storage (Hard Disk / SSD):

Adequate disk space is required to store the virtual machine files, Oracle Linux ISO image, and snapshots.

- Minimum: 40 GB free disk space
- Recommended: 60 GB or more (SSD preferred for better performance)

Display and Input Devices:

A standard monitor, keyboard, and mouse are required to interact with the virtual machine during installation and configuration.

Network Interface:

A working network adapter (Ethernet or Wi-Fi) is required to enable internet access for updates and package installation inside the virtual machine.

3.1.2 Virtual Machine Requirements

The virtual machine itself also needs allocated resources from the host system:

Virtual CPU:

- Minimum: 1 CPU core
- Recommended: 2 CPU cores

Virtual Memory (RAM):

- Minimum: 2 GB
- Recommended: 4 GB

Virtual Disk:

- Minimum: 30 GB
- Recommended: 40–50 GB

Allocating sufficient resources ensures that Oracle Linux Server runs smoothly and performs well during use.

3.2 Software Requirements

Software requirements include the operating systems, virtualization tools, and installation files necessary to complete the project.

3.2.1 Host Operating System

The host machine must have a working operating system that supports virtualization software. Common supported host operating systems include:

- Microsoft Windows (Windows 10 / Windows 11)
- Linux distributions (Ubuntu, Fedora, etc.)
- macOS (Intel-based systems)

In this project, the host operating system is assumed to be Windows, which is commonly used by students and supports Oracle VM VirtualBox.

3.2.2 Virtualization Software

Virtualization software is required to create and manage virtual machines. For this project, the following tool is used:

- Oracle VM VirtualBox
- Oracle VM VirtualBox is chosen because:
- It is free and open-source
- It supports Linux server installations
- It is easy to use for beginners
- It works well on Windows systems
- It supports snapshots, networking, and resource management

Alternative tools such as VMware Workstation exist, but VirtualBox is sufficient and appropriate for academic use.

3.2.3 Guest Operating System

Oracle Linux Server ISO Image

Oracle Linux Server is the guest operating system installed inside

the virtual machine.

- It is downloaded from the official Oracle website in ISO format.

Key reasons for selecting Oracle Linux Server:

Enterprise-level Linux distribution Based on Red Hat Enterprise Linux (RHEL)

- Stable and secure
- Long-term support
- Widely used in servers, cloud, and databases
- Strong integration with Oracle products

3.2.4 Additional Software and Tools

- Web Browser: Used to download Oracle Linux ISO and documentation.
- PDF Reader: For reading installation guides and reference materials.
- Screenshot Tool: Used to capture installation steps and error messages as required in the documentation.

3.3 Network and Internet Requirements

Internet connectivity is optional but highly recommended.

Required for:

- Downloading Oracle Linux ISO
- Installing updates and packages
- Accessing online documentation
- Network Mode in VirtualBox:

4,INSTALLATION

Step 1: Check Host Computer System Properties

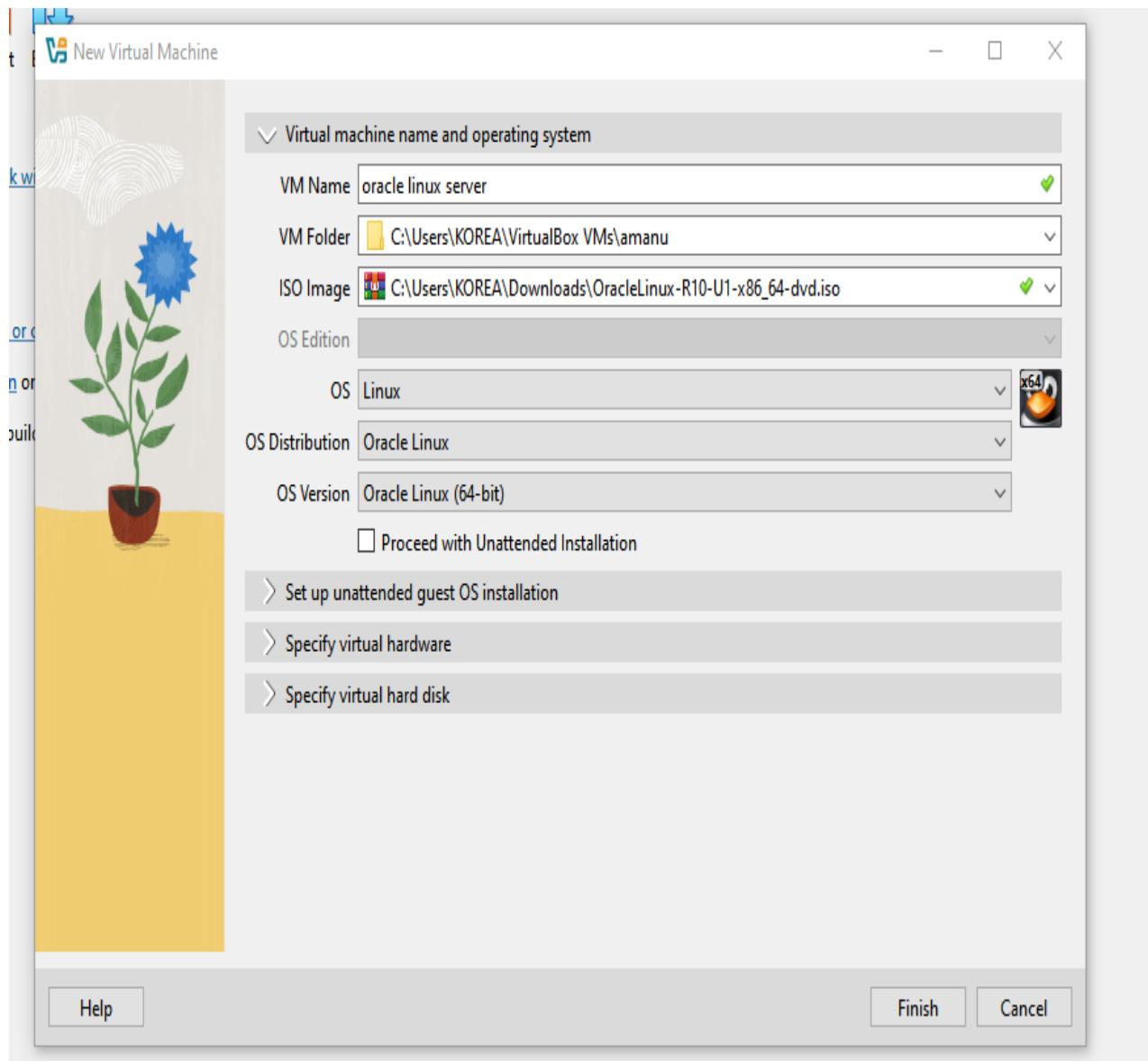
Before starting the installation, the system specifications of the host computer must be checked.

About

Installed RAM 4.00 GB DDR3	Processor Intel(R) Core(TM) i7-4790 CPU @ 3.60GHz 3.60 GHz	Graphics Card 113 MB Intel(R) HD Graphics 4600	Storage 932 GB 185 GB of 932 GB used																		
DESKTOP-L2IOAAT OptiPlex 7020			Rename this PC																		
Device Specifications			Copy																		
<table><tr><td>Device Name</td><td>DESKTOP-L2IOAAT</td></tr><tr><td>Processor</td><td>Intel(R) Core(TM) i7-4790 CPU @ 3.60GHz 3.60 GHz</td></tr><tr><td>Installed RAM</td><td>4.00 GB</td></tr><tr><td>Graphics Card</td><td>Intel(R) HD Graphics 4600 (113 MB)</td></tr><tr><td>Storage</td><td>932 GB HDD ST1000DM003-1ER162</td></tr><tr><td>Device ID</td><td>3F426148-BC50-4EF6-A7D1-0DA8A6CBB300</td></tr><tr><td>Product ID</td><td>00330-80000-00000-AA105</td></tr><tr><td>System Type</td><td>64-bit operating system, x64-based processor</td></tr><tr><td>Pen and touch</td><td>No pen or touch input is available for this display</td></tr></table>				Device Name	DESKTOP-L2IOAAT	Processor	Intel(R) Core(TM) i7-4790 CPU @ 3.60GHz 3.60 GHz	Installed RAM	4.00 GB	Graphics Card	Intel(R) HD Graphics 4600 (113 MB)	Storage	932 GB HDD ST1000DM003-1ER162	Device ID	3F426148-BC50-4EF6-A7D1-0DA8A6CBB300	Product ID	00330-80000-00000-AA105	System Type	64-bit operating system, x64-based processor	Pen and touch	No pen or touch input is available for this display
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Pen and touch	No pen or touch input is available for this display																				

Step 2: Prepare Installation Resources

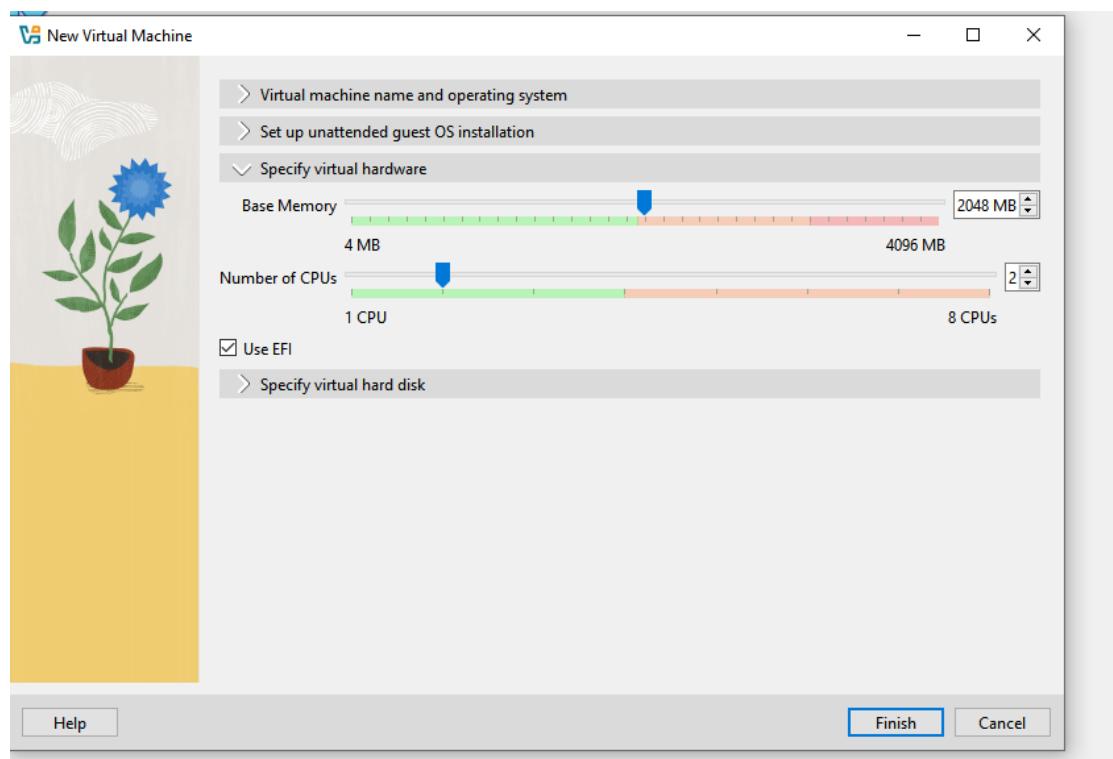
: VirtualBox installed and Oracle Linux ISO file (combined view)



Step 3: Create and Configure Virtual Machine

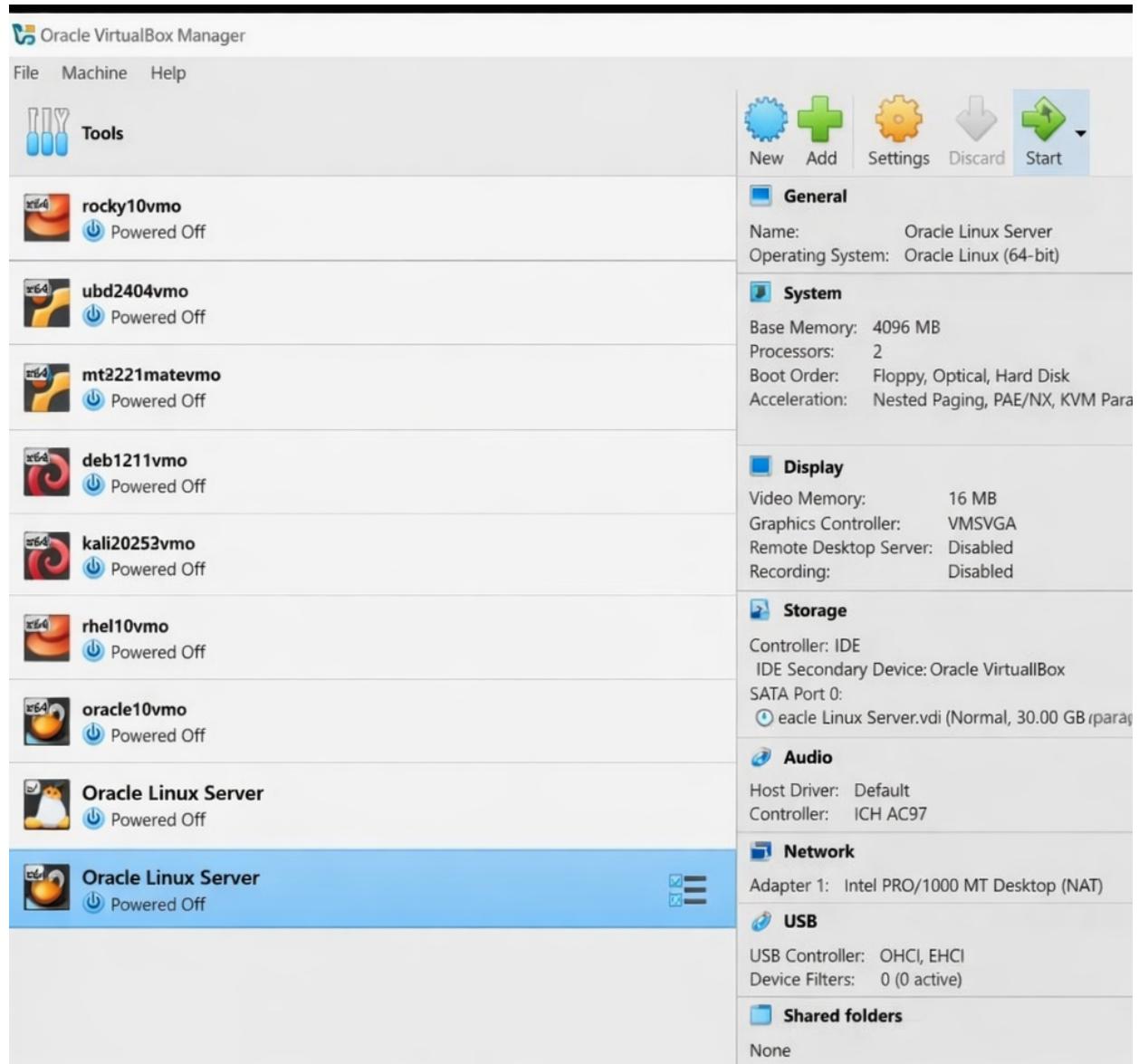
VM configuration summary (RAM, CPU, Disk)

Then click finish button



Step 4: the Home page of oracle virtualBox manager

- We found the tools of our _oracle Linux server
- Click start button



Step 5: Configure Basic Terminal

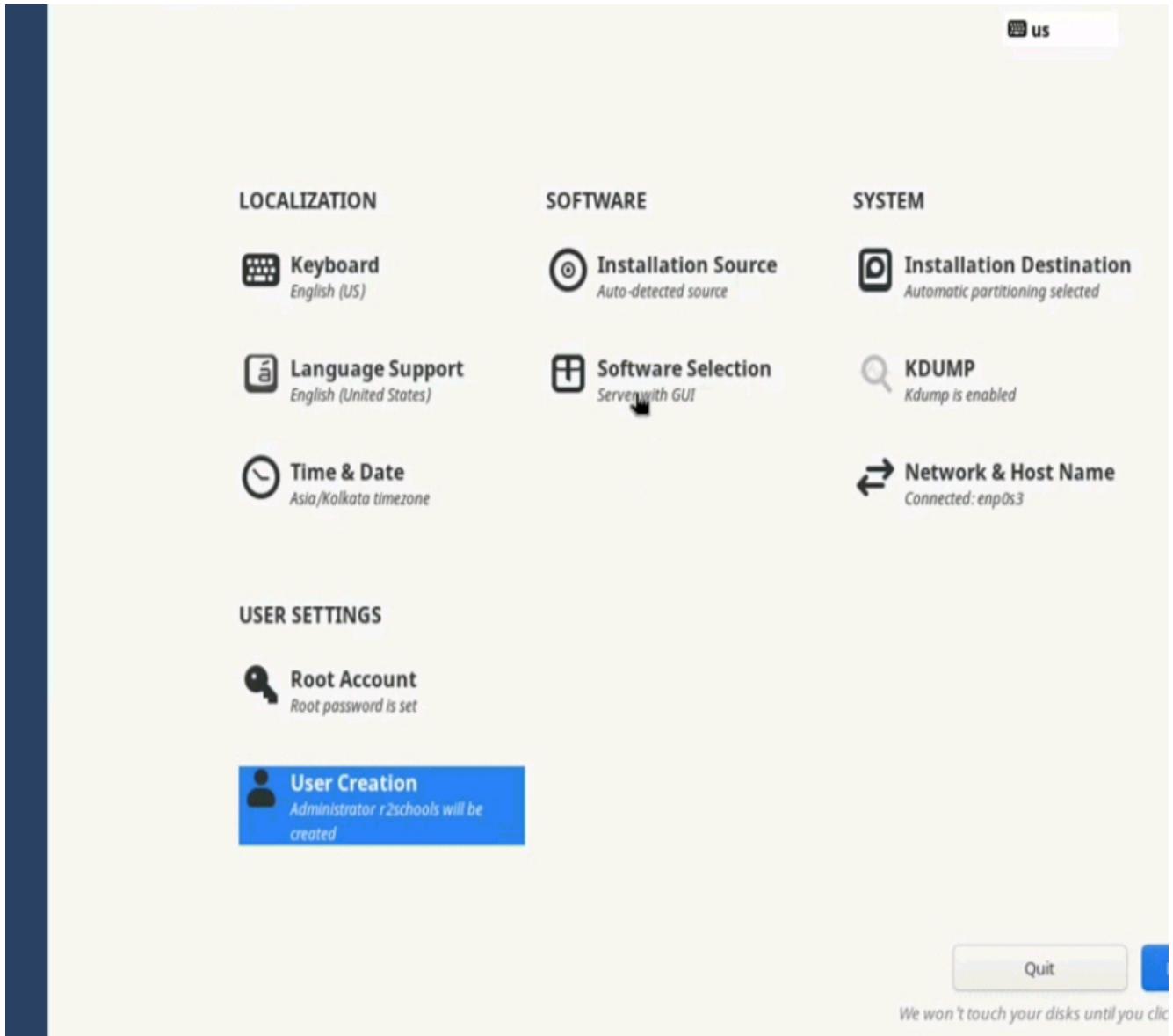
Select installation language

Then click 10.1 button.



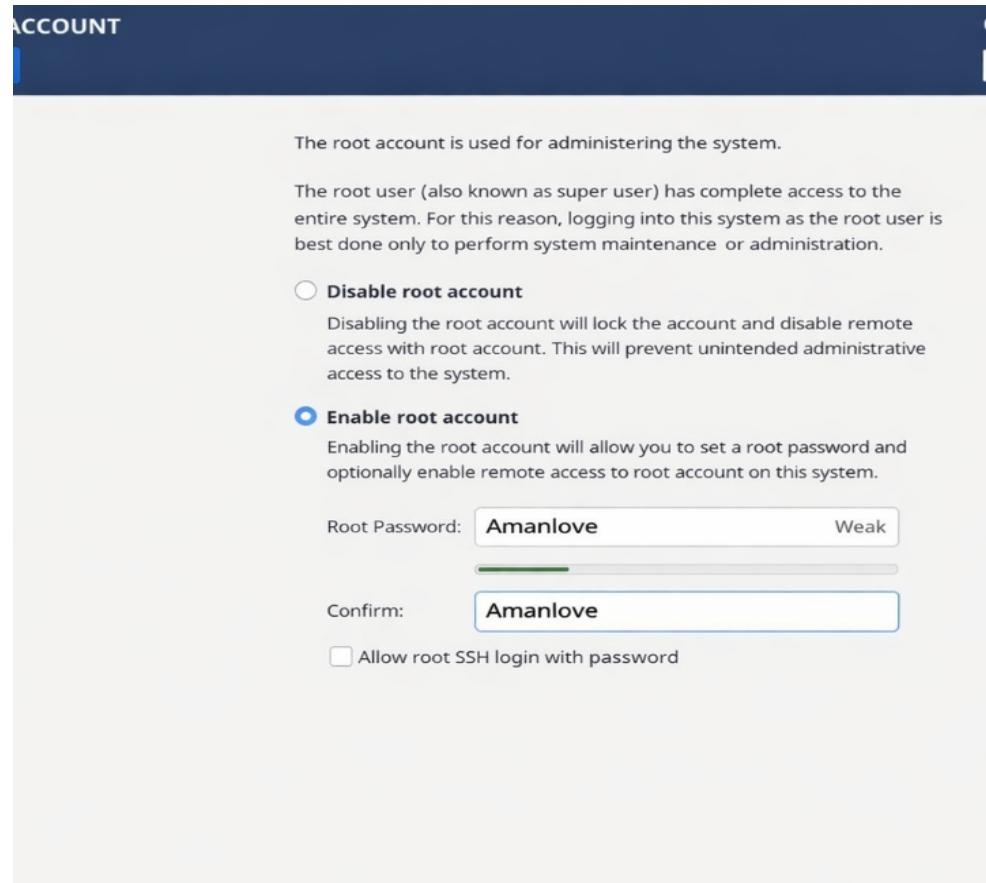
Use the ↑ and ↓ keys to select which entry is highlighted.
Press enter to boot the selected OS, 'e' to edit the commands
before booting or 'c' for a command-line.

Steps 6: Installation summary screen (language, disk, network)



Steps 7 : User and root account configuration screen

- I set the root password "Aman love"



Step 7: Create user configuration

Create a user account using:

Full Name: Amanu Muhammed

Administrator privileges enabled

CREATE USER

Done

Full name Amanu Muhammed

User name Amanu Muhammed

Add administrative privileges to this user account (wheel group)

Require a password to use this account

Password Amanlove



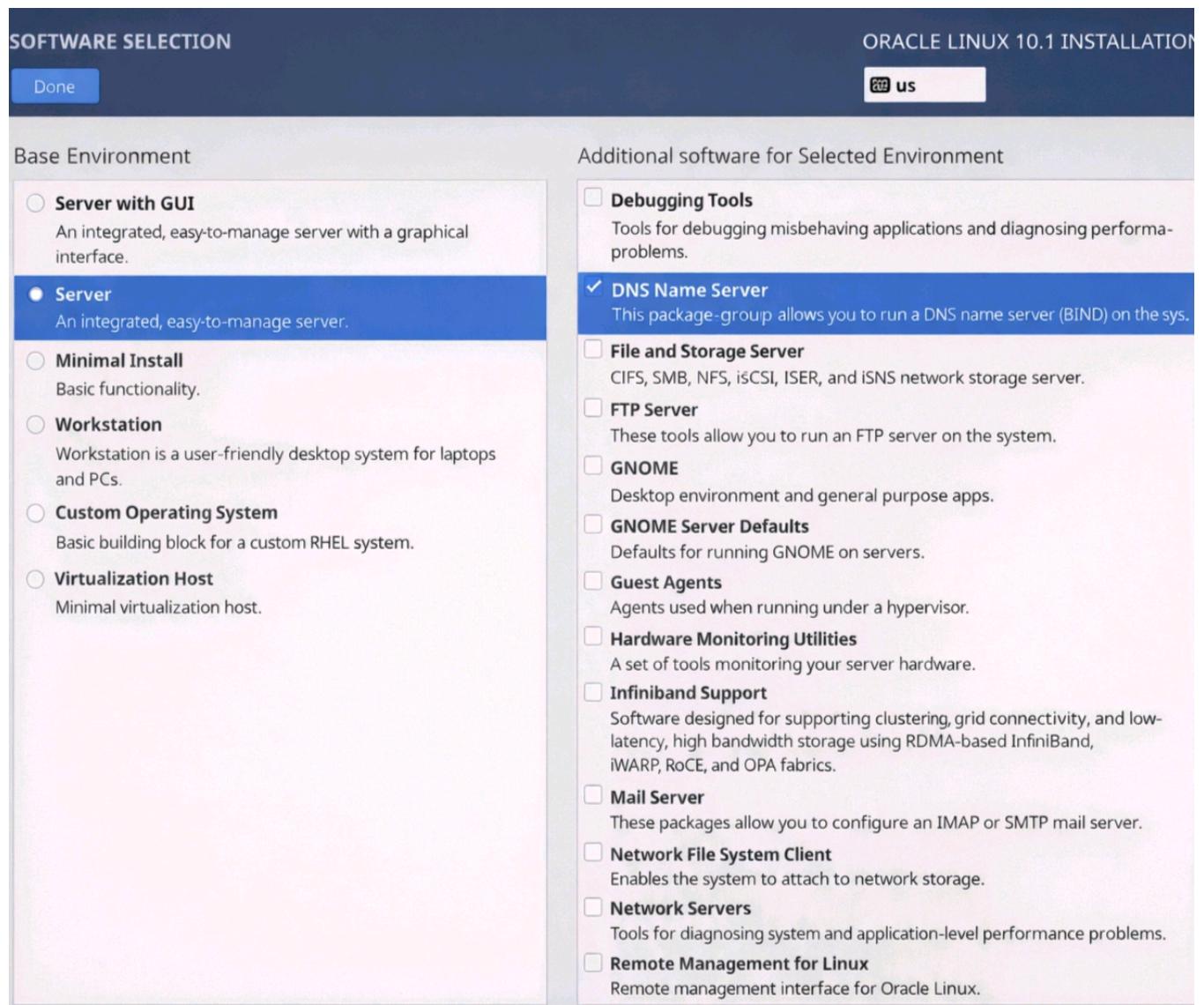
Strong

Confirm password Amanlove



Advanced...

Step 8: Software selection



Steps 9: Begin installation

Complete!

Oracle Linux is now successfully installed and ready for you to use.
Go ahead and reboot your system to start using it.

[Reboot System](#)

 Use of this product is subject to the license agreement found at /usr/srarelinux-release/EULA

Steps 10: Reboot system login or terminal

Oracle Linux Server 10.1
Kernel 6.12.0-100.28.2.el10uek.x86_64 on x86_64

Web console: <https://localhost:9090/>

localhost login: Amanu Muhammed

Password:

AmanuMuhammed@vbox:~\$ sudo dnf update && sudo upgrade

Steps 11, successful oracle Linux server home page



5. Issues (Problems Faced During Installation)

During the installation of Oracle Linux Server using Oracle VM VirtualBox, I faced several common problems, especially during my first practice installation. These issues are typical for beginners and helped me understand virtualization and operating system installation more deeply.

- Issue 1: Oracle (64-bit) Option Not Appearing**

Problem: When creating the virtual machine, I could not see the Oracle (64-bit) option VirtualBox.

Reason: Virtualization was disabled in BIOS or conflicted with Windows virtualization features.

- Issue 2: Virtual Machine Failed to Start**

Problem: After configuration, the virtual machine failed to start and displayed an error message.

Reason: Incorrect VM settings or insufficient system resources.

- Issue 3: Slow Installation Process**

Problem: The installation process was very slow and appeared to be stuck.

Reason: Low RAM allocation and multiple applications running on the host system.

- Issue 4: No Network Connection After Installation**

Problem:

After installation, Oracle Linux started successfully but had no

internet access.

Reason:

Network adapter was disabled or not properly configured.

- **Issue 5: User Account Configuration Confusion**

Problem:

I was unsure how to correctly create the user account during installation.

Reason:

Unclear understanding of whether to use a nickname or full name.

Issue 6: System Booted Back to Installation Screen

Problem:

After rebooting, the system returned to the installation menu.

Reason:

The ISO file was not removed from the virtual optical drive.

6. Solutions to the Problems Faced

After identifying the problems during the installation of Oracle Linux Server using Oracle VM VirtualBox, I applied the following solutions. These solutions were implemented based on understanding of virtualization, system configuration, and installation requirements.

Solution to Issue 1: Oracle (64-bit) Option Not Appearing

- I enabled virtualization technology (Intel VT-x / AMD-V) from the system BIOS.
- I disabled conflicting Windows features such as Hyper-V.
- I restarted the system and reopened VirtualBox.

Result: The Oracle (64-bit) option became available.

Solution to Issue 2: Virtual Machine Failed to Start

- I reviewed the virtual machine settings.
- I increased RAM allocation and ensured CPU virtualization was enabled.
- I avoided running heavy applications on the host system.

Result: The virtual machine started successfully.

Solution to Issue 3: Slow Installation Process

- I increased the allocated RAM from 2 GB to 4 GB.
- I closed unnecessary applications on Windows.
- I waited patiently, understanding that server OS installation may take time.

Result: Installation completed smoothly without freezing.

Solution to Issue 4: No Network Connection After Installation

- I enabled the network adapter in VirtualBox settings.
- I set the network mode to NAT.
- I restarted the network service inside Oracle Linux.

Result: Internet connectivity worked properly.

Solution to Issue 5: User Account Configuration Confusion

- I followed the project guideline and used my full name while creating the user account.
- I enabled administrator privileges for the user.

Result: User account worked correctly with proper permissions.

Solution to Issue 6: System Booted Back to Installation Screen

- I removed the Oracle Linux ISO file from the virtual optical drive.
- I rebooted the virtual machine.

Result: The system booted normally into Oracle Linux Server.

7. Filesystem Support

A filesystem defines how data is stored, organized, and accessed on a disk. During the installation of Oracle Linux Server (R10-u1-x86_64-dvd), the installer provides support for Linux-native filesystems that are suitable for server environments. Some filesystems are fully supported, while others are only partially supported or not supported at all.

- Supported and Common Filesystems
- ext4 (Fully Supported – Used in this project)
- ext4 is a native Linux filesystem and is widely supported by Oracle Linux Server.

I selected ext4 because it is:

- Stable and reliable
- Easy to manage
- Supports large files and partitions

- Includes journaling to protect data

These filesystems are designed for Apple macOS and are not supported for Oracle Linux installation.

File system	Support status	Reason
NTFS	limited	Window -based
FAT32	limited	File size and security limit
exFAT	limited	No journaling or permissions
ext4	fully-supported	Stable Linux-native
Btrfs	Supported	advanced feature
XFS	Supported	High-performance filesystem
HFS+	Not supported	Apple-specific
APFS	Not supported	Apple-specific

Advantage

1. Advantages of Using Virtualization

- I can install and practice Oracle Linux without affecting my Windows system.
- You can safely make mistakes, reinstall, and experiment.
- We do not need additional physical hardware.
- Multiple operating systems can run on the same PC.

2. Advantages of Hardware Requirements

- The project works on normal student laptops or desktops.
- No high-end hardware is required.
- Resource allocation (RAM, CPU, disk) can be adjusted easily.

3. Advantages of Software Requirements

- Oracle VM VirtualBox is free and easy to use.
- Oracle Linux Server is an enterprise-grade operating system.
- The ISO-based installation allows offline installation after download.

4. Advantages of the Installation Process

- Step-by-step installation improves understanding of OS concepts.
- Automatic partitioning reduces complexity for beginners.
- Creating a user account with full name improves system identification and security.

5. Advantages of Filesystem Choices

- Linux-native filesystems (ext4, XFS, Btrfs) are stable and secure.
- ext4 is simple and reliable for learning.
- XFS supports high-performance workloads.
- Filesystems are chosen based on purpose, not random selection.

8.2 Disadvantages

1. Disadvantages of Virtualization

- Performance is lower than installing directly on hardware.
- Requires enough RAM and CPU; low-spec PCs may be slow.

2. Disadvantages of Hardware Limitations

- Old computers may not support virtualization.
- Limited RAM affects installation speed and system performance.

3. Disadvantages of Software Setup

- VirtualBox depends on BIOS and Windows settings.
- Conflicts with Hyper-V can prevent VM startup.

4. Disadvantages of the Installation Process

- Beginners may face errors such as boot failure or network issues.
- Incorrect settings can require reinstalling the OS.

5. Disadvantages of Filesystem Choices

- ext4 lacks advanced features like snapshots.
- XFS is harder to resize.
- Non-Linux filesystems (NTFS, FAT32, exFAT) are not suitable for Linux system installation.

9. Conclusion

This project provided me with a valuable opportunity to move beyond theoretical knowledge and gain real practical experience in operating system installation and virtualization. By installing Oracle Linux Server (R10-u1-x86_64-dvd) using Oracle VM VirtualBox on a Windows system, I was able to understand how operating systems interact with hardware, software, and users in a controlled and safe environment.

Throughout the project, I learned the importance of preparing proper hardware and software requirements before installation. Checking system properties, enabling virtualization, and allocating resources such as CPU, RAM, and storage helped me realize that an operating system depends heavily on underlying hardware. This experience showed me that even a small configuration mistake can affect system performance or prevent installation.

Using virtualization technology made the learning process easier and safer. I could practice installation multiple times, make mistakes, and correct them without damaging my main system. This flexibility allowed me to understand the installation process more deeply and build confidence. As students, we do not always have access to multiple physical computers, so virtualization becomes an essential tool for learning and experimentation.

The installation process of Oracle Linux Server helped me understand important operating system concepts such as booting, disk partitioning, user management, and networking. Creating a user account using my full name and setting proper permissions improved my understanding of system security and access control. Facing installation issues and solving them by myself strengthened my problem-solving and troubleshooting skills.

I also gained a clear understanding of filesystem concepts and why

different operating systems use different filesystems. Learning about ext4, XFS, Btrfs, and comparing them with NTFS, FAT32, exFAT, HFS+, and APFS helped me understand that filesystem selection depends on system goals such as stability, performance, and compatibility. This knowledge is very important for system administration and real-world IT environments.

Overall, this project helped me connect classroom theory with real practice. It improved my technical confidence and gave me hands-on experience that will be useful in future courses and professional work. If you follow the same steps, practice patiently, and learn from mistakes, you will also gain a strong foundation in operating systems and virtualization.

10. Future Outlook / Recommendations

Based on the experience gained from this project, I strongly believe that the knowledge and skills developed can be expanded further in the future. Installing Oracle Linux Server in a virtual environment was only the beginning. With more practice and deeper exploration, this setup can be used to gain advanced system administration skills.

In the future, I recommend exploring advanced Oracle Linux features such as package management, system updates, firewall configuration, and user permission management. These tasks will help students understand how real servers are maintained in production environments. Practicing basic command-line operations and shell scripting will also improve efficiency and confidence when working with Linux systems.

I also recommend learning more about different virtualization technologies. While Oracle VM VirtualBox is suitable for learning, trying other platforms such as VMware or KVM can help you understand performance differences and enterprise-level virtualization. Using snapshots, cloning virtual machines, and network modes (NAT, Bridged, Host-only) will further improve practical skills.

Another important future direction is filesystem experimentation. Students can try installing Oracle Linux using different supported filesystems such as XFS or Btrfs and compare performance, reliability, and management complexity. This comparison will help in making better decisions in real-world system deployment.

For institutions and instructors, I recommend continuing to use virtual environments for operating system courses. Virtualization reduces hardware costs, minimizes risks, and allows every student to practice independently. It also prepares students for modern IT environments where virtualization and cloud computing are widely used.

Finally, I recommend continuous learning and hands-on practice. Operating systems cannot be fully understood through theory alone. If you keep practicing, making mistakes, and solving real problems, you will build strong technical skills and confidence that are essential for a career in information systems and system administration.

2,Virtualization in Modern Operating Systems

What is Virtualization?

Virtualization is a technology that allows multiple operating systems to run on a single physical computer by creating virtual machines. Each virtual machine acts like a real computer with its own operating system, memory, and storage.

Why Virtualization is Used

Virtualization is used because:

- It reduces hardware cost and risk
- It is widely used in servers, cloud computing, and data centers
- It is ideal for learning, testing, and development

How Virtualization Works

- Virtualization works using a hypervisor (such as Oracle VM VirtualBox):

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