Title: Understanding Virtualization by installing Virtual Box and creating VM(Linux) for a React Application

1. Objective:

The objective of this lab assignment is to understand and analyze the capabilities of Virtualization by installing a Linux VM using Virtual Box and configure port forwarding to access the application from the host machine's browser.

2. Background:

- ## Theory/Concepts:

  Virtualization: Virtualization is used to create a virtual version of an underlying service with the help of Virtualization, multiple operating systems and applications can run on the same machine and its same hardware at the same time, increasing the utilization and flexibility of hardware.

  Hosted Hypervisor: A Hosted Hypervisor is a virtual machine (VM) manager that is installed as a software application on an existing operating system (OS). It is installed on the host OS and does not directly interact with the underlying host machine's hardware.

  VirtualBox: A free and open-source virtualization software that enables users to run multiple operating systems on a single physical machine.

  React: A JavaScript library for building user interfaces, often used for developing single-page applications.

- ## Context:

  We will use Oracle VirtualBox to create and manage the Linux VM, and a React application will be deployed within this VM, also port forwarding will be configured to allow access to the React application from the host machine.

3. Tools and Services

- **Cloud Services:**

  None (Local setup, no cloud services used).

- **Software/Tools:**

  Oracle VirtualBox: Virtualization software for creating and managing VMs.

  Ubuntu Linux ISO: Operating system image for creating the VM.

  Node.js and npm: Required for running and managing React applications.

  React: JavaScript library for building user interfaces.

  Visual studio code: A text editor which helps to modify the code.

4. Experiment Setup

Step-by-Step Configuration:

VirtualBox Installation:

- Download and install Oracle VirtualBox from the VirtualBox website.
- Download the Ubuntu ISO image from here.

VM Creation:

- Open VirtualBox and click on “New.”
- Set the name (e.g., “LinuxVM”), and select the folder where VM needs to be located and ISO image that is downloaded.
- Set the username and password for LInuxVM

- Allocate memory (e.g., 7185 MB), and CPU's (e.g., 4)
- Create a virtual hard disk (e.g., 25 GB) using the default VDI

Configure Network Settings:

- Once Ubuntu is installed, go to VM settings, navigate to "Network," and ensure the network adapter is set to "NAT" for initial setup.

Port Forwarding Configuration:

- In VM settings, navigate to "Network," and click on "Advanced."
- Click on "Port Forwarding" and add a new rule:

  Name: App

  Protocol: TCP

  Host IP: (Leave blank)

  Host Port: 3000

  Guest IP: (Leave blank)

  Guest Port: 3000

Install Node.js and npm:

- Open a terminal in Ubuntu and run:

  sudo apt install curl

  curl -o- https://raw.githubusercontent.com/nvm-sh/nvm/v0.40.1/install.sh | bash

  nvm install v22

- Install Visual Studio code:

  sudo snap install –classic code

Install and Set Up React Application:

- Install Node.js and npm:

Clone the repository from github:

git clone repository_url

Install the node modules:

npm install

Start the React development server and mongo db server:

npm start
node server.js

Access Application:

- Open a browser on the guest & host machine and navigate to *http://localhost:3000* to see the React application.

5. Execution

Tasks Performed:

- Created and configured a Linux VM using VirtualBox.
- Installed Ubuntu and VirtualBox Guest Additions.
- Configured port forwarding in VirtualBox.
- Installed Node.js and npm on the VM.
- Deployed and ran a React application within the VM.

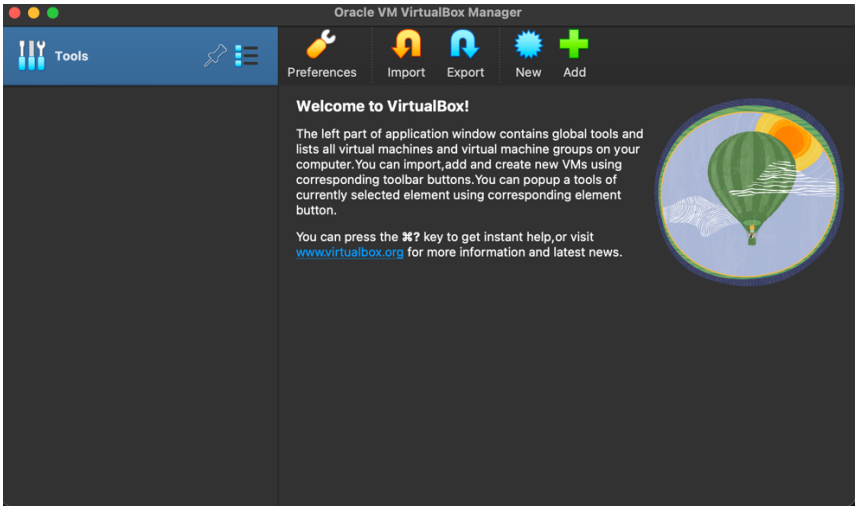
Monitoring:

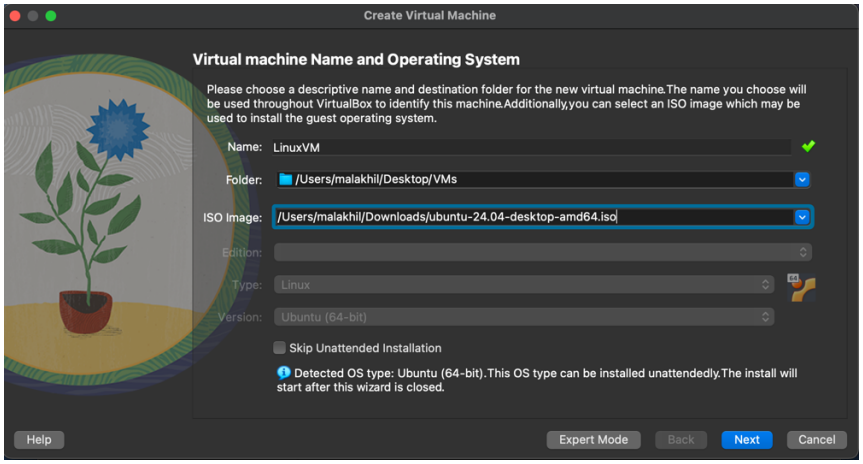
- Check the React application status in the VM's terminal.
- Monitor network traffic and port forwarding functionality to ensure proper access from the host machine.

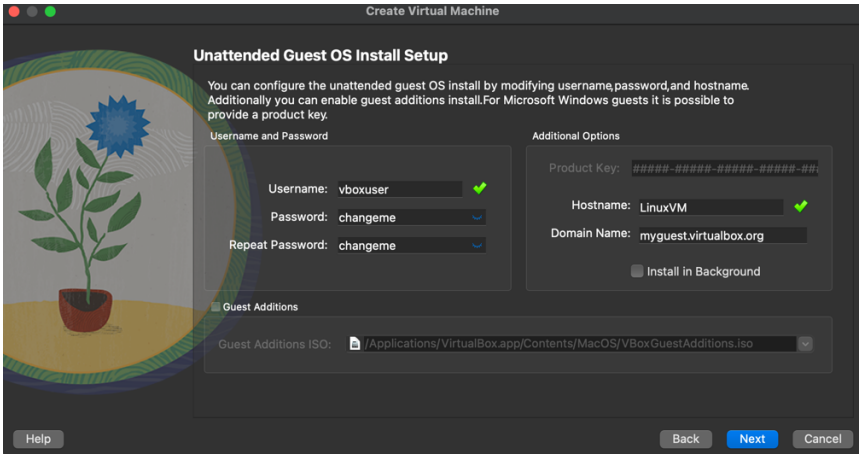
6. Observations

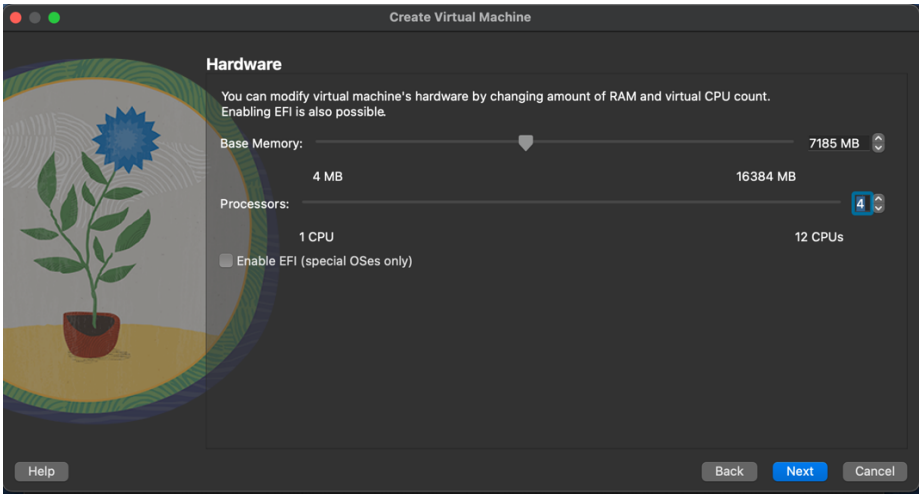
Data Collected:

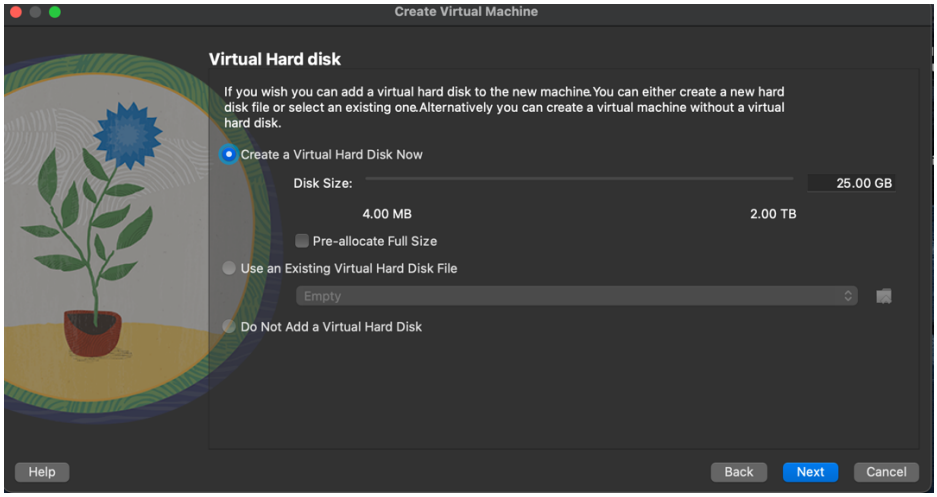
Setting up the Virtual Machine





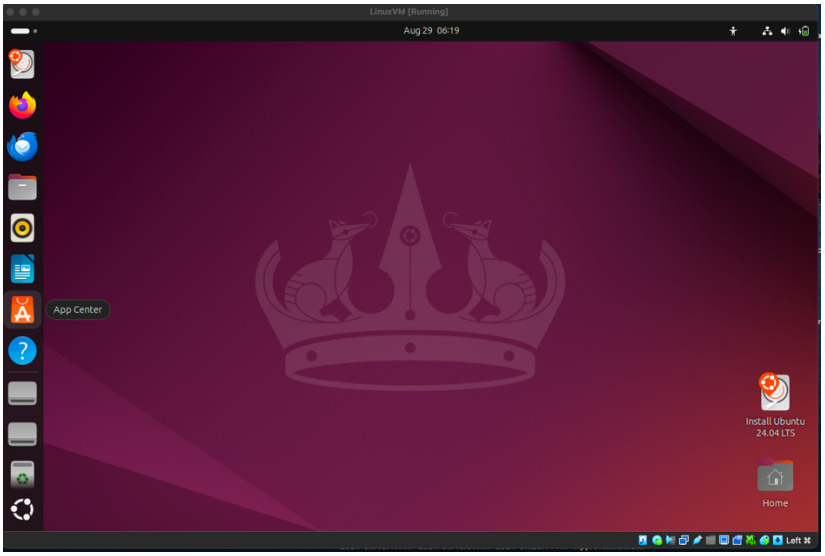


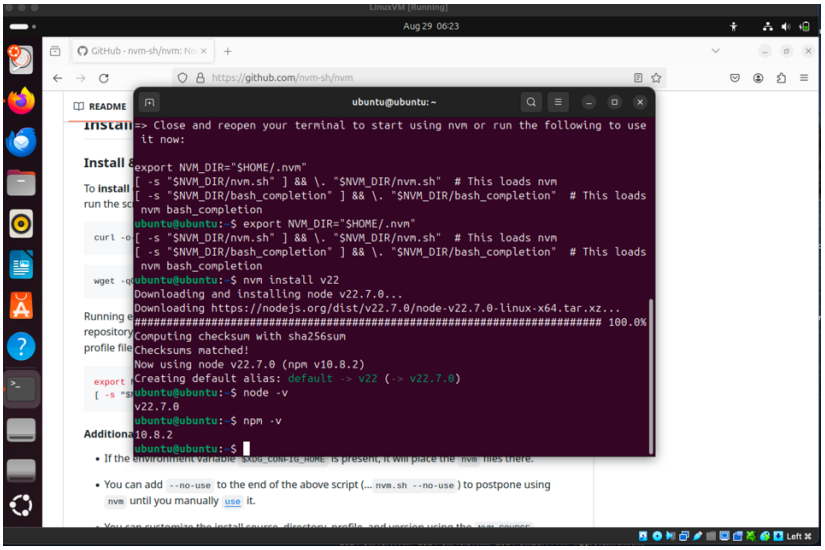

Create Virtual Machine
Hardware
You can modify virtual machine's hardware by changing amount of RAM and virtual CPU count.
Enabling EFI is also possible.
Base Memory:
7185 MB
4 MB
16384 MB
Processors:
4
1 CPU
12 CPUs
Enable EFI (special OSes only)
Help
Back
Next
Cancel

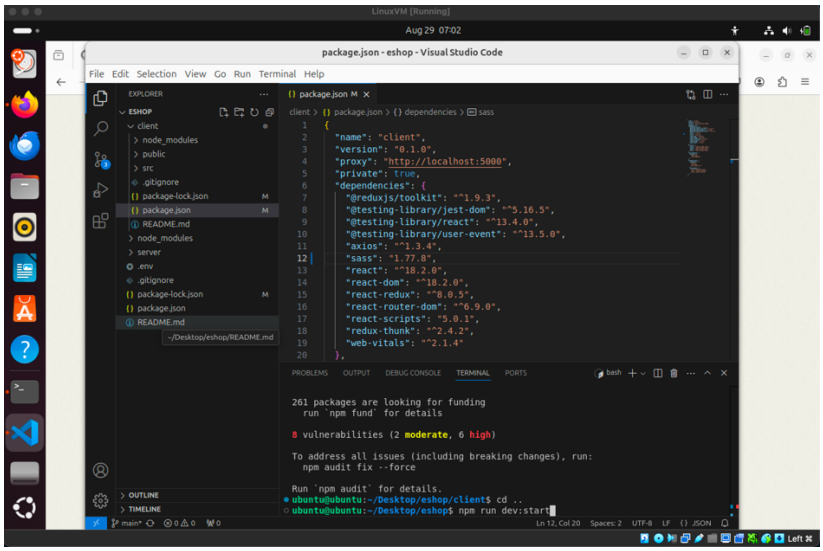

Create Virtual Machine
Virtual Hard disk
If you wish you can add a virtual hard disk to the new machine.You can either create a new hard disk file or select an existing one.Alternatively you can create a virtual machine without a virtual hard disk.
Create a Virtual Hard Disk Now
Disk Size:
25.00 GB
4.00 MB
2.00 TB
Pre-allocate Full Size
Use an Existing Virtual Hard Disk File
Empty
Do Not Add a Virtual Hard Disk
Help
Back
Next
Cancel


Create Virtual Machine
Summary
The following table summarizes the configuration you have chosen for the new virtual machine.
When you are happy with the configuration press Finish to create the virtual machine.Alternatively you can go back and modify the configuration.
Machine Name and OS Type
Machine Name LinuxVM
Machine Folder /Users/malakhil/Desktop/VMs/LinuxVM
ISO Image /Users/malakhil/Downloads/ubuntu-24.04-desktop-amd64.iso
Guest OS Type Ubuntu (64-bit)
Skip Unattended Install false
Unattended Install
Username vboxuser
Product Key false
Hostname/Domain Name LinuxVM.myguest.virtualbox.org
Install in Background false
Install Guest Additions false
Hardware
Base Memory 7185
Processor(s) 4
EFI Enable false
Help
Back
Finish
Cancel

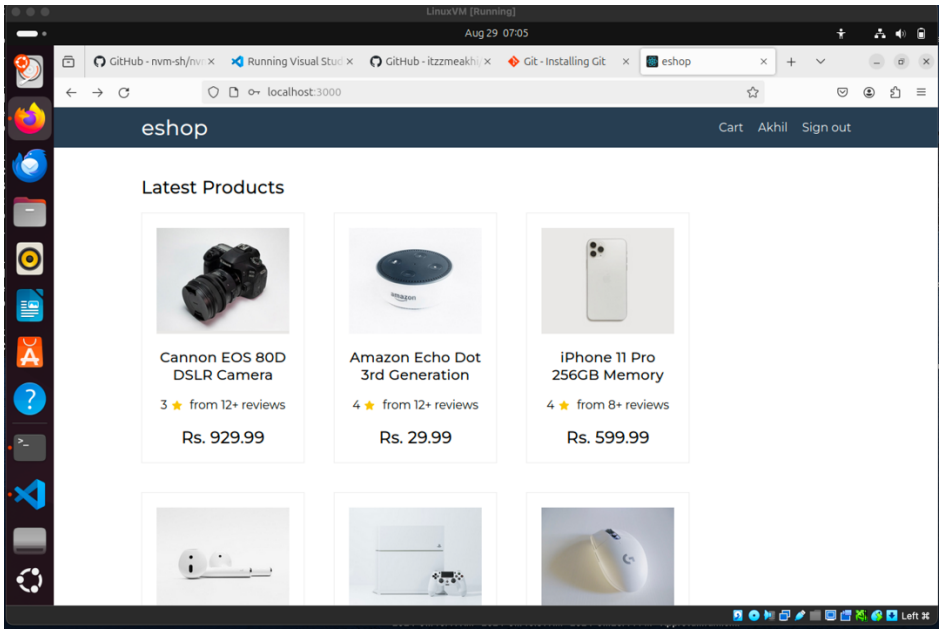
Installing the required tools for running a React Application



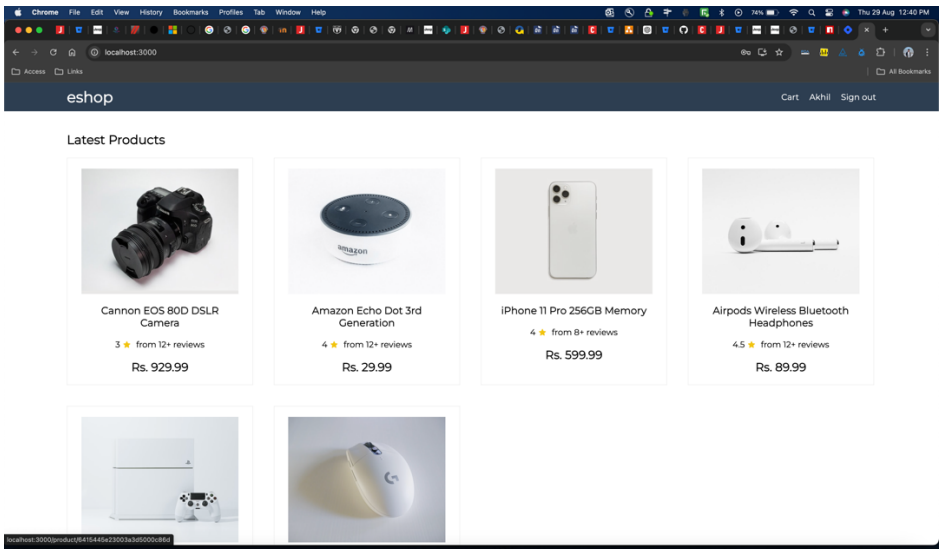




Accessing application from Guest Browser(VM):



Accessing application from Host Browser:



7. Results

Outcome:

- Concept of Virtualization was understood by installing Virtual Box and running a React Application using Hosted Hypervisor.
- The React application should be accessible from the host machine’s browser via the configured port forwarding.