BAHIR DAR UNIVERSITY

INSTITUTE OF TECHNOLOGY

DEPARTMENT OF SOFTWARE ENGINEERING

Course code – OSSP

Operating system and system programming individual assignment

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Introduction

Background:

Knoppix, is a bootable Live Linux that is based on Debian(Debian 64-bit for my knoppix), first appeared in 2000s. Its main focus was to have an entirely functional operating system that didn't require installation on a hard drive which means that we can use it live, and could be run directly from removable media, such as USB drives. Its "live" capability makes it an asset for several uses, such as:

-**System Recovery and Repair**: if we use persistence storage rather than live, knoppix is able to recover data even if we shutdown it. It is also able to boot into damaged system.

-**Software Testing**: we could test out different programs and enjoy the full functionality of a Linux environment, I personally experienced it through the terminal .

-**For learning**: Knoppix provided a secure and easy-to-use platform for learning about open-source software and Linux.when we open the os we can get part of education section .

-**Portable Work Environment:** It enabled us to access our familiar tools and operating system on various machines by carrying them along with them on a bootable medium.

-**Educational Purposes:** To discover Linux distributions, live operating systems, and system administration principles within a controlled virtual lab.

Knoppix has only improved smoothly through the years, adding support for diverse hardware, additional software packages. Numerous other similar systems are still influenced by its position as a pioneer Live Linux distribution.my resources are from 8 to 9 years past youtube videos which made it difficult for me to access many informations .

Motivation:

->Here the main motivation for knoppix are listed

- **Non-Destructive Exploration:** Virtualization allows us to experience and utilize Knoppix and its extensive suite of tools without making any permanent changes to our host operating system. This provides a safe and isolated environment for experimentation and learning.(knoppix can not made any effect on the host operating system).

- **Convenience and Accessibility:** With virtualization software like VMware Workstation and VirtualBox, we can easily launch Knoppix as a virtual machine within their existing operating system. This eliminates the need for physical bootable media and system restarts.

- **Portability and Consistency:** A Knoppix virtual machine image(which I used when installing knoppix to attach to the virtual machine) can be easily copied and shared, providing a consistent and reproducible environment across different host systems.

- **Resource Management:** Virtualization allows for flexible allocation of system resources (CPU, RAM, storage) to the Knoppix environment, optimizing performance for specific tasks.

Objectives

#The main goals of the Knoppix operating system revolve around its nature as a live Linux distribution. These are its main goals:

1.operating system that can be used directly from removable media (CD, DVD, USB stick) and not need to be permanently installed on a hard disk. This provides an opportunity for us to try a full Linux environment without changing their current system.(I actually installed on hard disk).

2.To offer excellent hardware detection capability. Knoppix attempts to automatically detect and configure enormous quantities of hardware devices, allowing it to be booted on multiple computer platforms with minimal manual driver loading in most cases.

3.To serve as a portable software demo and test station. We are able to demo software or test for compatibility on different hardware without full installation.

4.To provide an educational platform for learning Linux and open-source software. As I described previously Its availability and pre-configured nature make it an ideal introduction for Linux newcomers.(knoppix is very usefull for educational platforms).

5.To be a general-purpose portable operating system. We can carry their working environment and utilities with them on a bootable platform.

.In essence, Knoppix is meant to be an easily accessible, highly flexible, yet very powerful computing tool for just about any conceivable computing task, primarily emphasizing the ability to act as a live system, when i compare it to ubuntu which i have seen in my lab session I really appreciate knoppix for use, it is more user friendly.

Requirements

- In this part we are going to see the requirements to fullfill installation of knoppix operating system within a virtualized environment on a host system using software tools such as VMware Workstation or **Oracle VM VirtualBox.** (the bold one is the virtual machine I used).

i. Hardware Requirements (Host System)

- These are the minimum and recommended hardware specifications for the computer where we will be installing and running the virtualization software.We keep in mind that how well the virtualized Knoppix environment runs will heavily depend on the capacity of our host machine.

Processor (CPU):(I attached the images for all the requirements on the other section) I used 2 processor.

Minimum: A recent compatible CPU.

Recommended: Multi-core processor (Intel Core i5) to provide sufficient processing capability to the virtual machine without making a significant impact on the performance of the host system

Random Access Memory (RAM):

Minimum: 4 GB of RAM.

Recommended: 8 GB or more. The amount of RAM allocated to the Knoppix virtual machine will directly impact how responsive it feels. A minimum of 1 GB is often suggested for an ordinary Knoppix live session, but more (i.e., 2-4 GB) will be smoother if we intend to utilize a number of applications within the virtual environment.

Hard Disk Space (Host):

Minimum: Sufficient free disk space to have the virtualization software resident (e.g., VMware Workstation or VirtualBox) and to store the Knoppix ISO image.

Recommended: A minimum of 20-30 GB of free space (I use 60GB) if we plan to create a virtual hard disk for Knoppix (I actually do not recommend because it is not absolutely necessary for running in live mode).

ii. Software Requirements

These are the pieces of software that we need to have installed or available on our host machine.

Host Operating System: A host operating system supported by our chosen virtualization software. This could be:

Linux (several distributions supported by VMware Workstation Pro/Player and VirtualBox) for knoppix we use linux.

Virtualization Software:we have to Install one of the following virtualization (linux) products on our host operating system:

Oracle VM VirtualBox (Linux): An open-source virtualization environment. We Download and install the latest stable release.

Knoppix ISO Image: We will require the ISO image file of the Knoppix operating system(I attached the image below while browsing the ISO image). It can be obtained from the official website of Knoppix or a trusted mirror.

Installation steps

-The installation steps for running Knoppix within a virtual environment.

I will provide the steps for Oracle VM VirtualBox. I will describe what we should see at each step, and I would include the corresponding screenshots.

The following steps outline how to set up a virtual machine to boot from the Knoppix ISO image in Oracle VM VirtualBox.

i. Oracle VM VirtualBox

First We have to download and install our chosen virtual machine.mine is Oracle VM VirtualBox

Open Oracle VM VirtualBox: Launch the VirtualBox application on our host computer.

We see the VirtualBox Manager window with options like "New" and "Add".

We Create a New Virtual Machine: Click the "New" button. This will open the "Create Virtual Machine" dialog.

Name and Operating System:

Name: Enter a name for our virtual machine (e.g., "Knoppix"). Here We are naming the virtual machine not user account.

Types: We select “Linux”

Version:we choose "Debian (64-bit)"

Memory Size: Allocate RAM to the virtual machine. I choose 1024 MB (1 GB), but we can also allocate more if our host system has sufficient RAM.

Hard Disk: Here we have option like “do not add virtual Hard Disk” (for live boot only) and the other option “add virtual Hard Disk” (for permanent persistent) I choose the second option so I can create the user account using my name on terminal because

if chose the first option I will
not have access to my account
if I shutdown down the
operating system because
knoppix is a live os.

1.After Creating the virtual machine, we select it in the virtualization software and click on settings.

2.Go to storage sections

3.under optical drive ,we choose the option to choose a disk file or “Browse”.

4.Then we navigate the ISO image file we downloaded. This will make the ISO file the virtual "DVD" that the VM boots from.

5. Start the Knoppix Virtual Machine:

Select our Knoppix VM in the virtualization software and click the "Start" button.

The virtual machine will boot from the Knoppix ISO image we attached.

General Steps to Install Knoppix to the Virtual Hard Disk:

Boot into the Knoppix Live Environment: When we start the virtual machine with the Knoppix ISO attached, it will typically boot into the live Knoppix desktop environment.

Find the Installer: we Look for an icon on the desktop or in the applications **menu** labeled something like:

"Install Knoppix to Hard Disk"

Launch the Installer: Double-click this icon to start the Knoppix installer.

Follow the Installation Wizard: The installer will guide us through a series of steps. These usually include:

Language Selection:we Choose our preferred language.

Installation Target:We Confirm that the installer has selected our virtual hard disk as the target for the installation.

Bootloader Installation: It will likely be asked if we want to install a bootloader.the default location is fine.

User Account Creation: we can create one after the installation is complete as described below using the terminal.

Confirmation and Installation: Review our settings and confirm that we want to proceed with the installation. The installer will then copy the Knoppix files to the virtual hard disk.

Reboot: Once the installation is complete, we'll be prompted to reboot the virtual machine. Make sure to remove the Knoppix ISO from the virtual machine's settings before rebooting so that it boots from the newly installed system on the virtual hard disk.

-There are other optional steps but to keep it short we let it go.

#To create a user account : we Follow these steps

1.Open Terminal

i.First we have to become Root user using the sudo command to temporarly become root user

Type the the command sudo -i then enter

Our terminal prompt becomes root@knoppix:~# indicating that we are successfully logged as root user

ii.Know we use the adduser command for creating new user.

adduser Alazar Alebel Necho

press enter then it will guide us with many prompts like

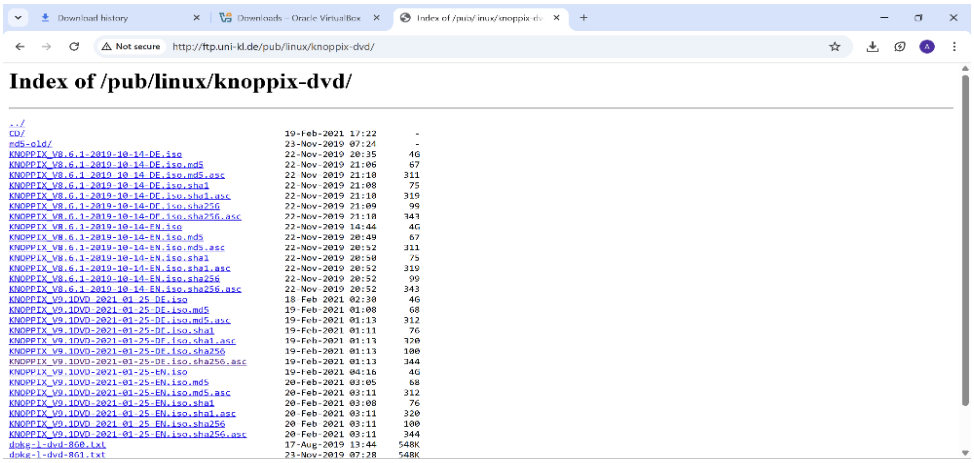
-Enter password for new user: we will be asked to create a password for the new user. Type a strong password (alazar@12*) and press Enter.

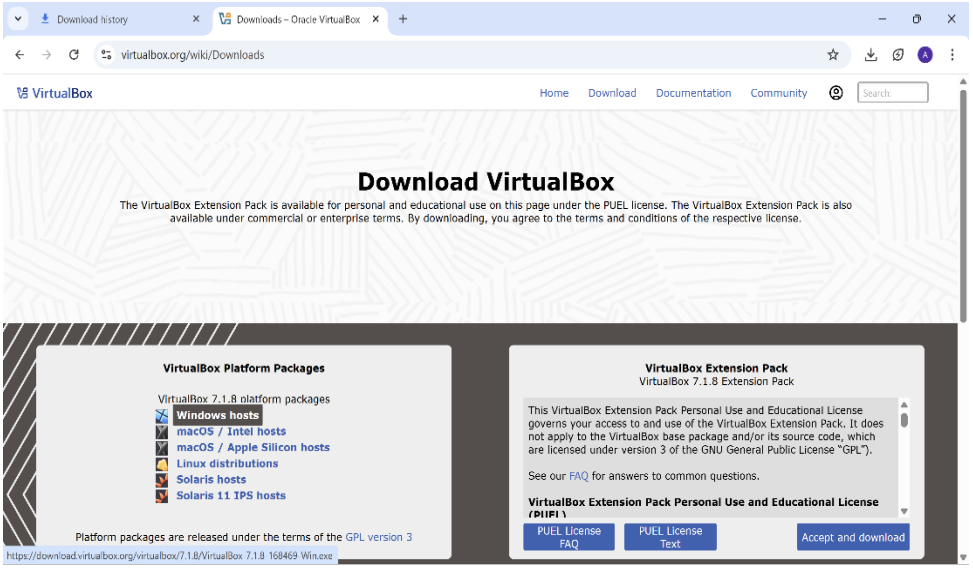
-Retype new password: we will be asked to confirm the password. Type again exactly as before (alazar@12*) and press Enter.

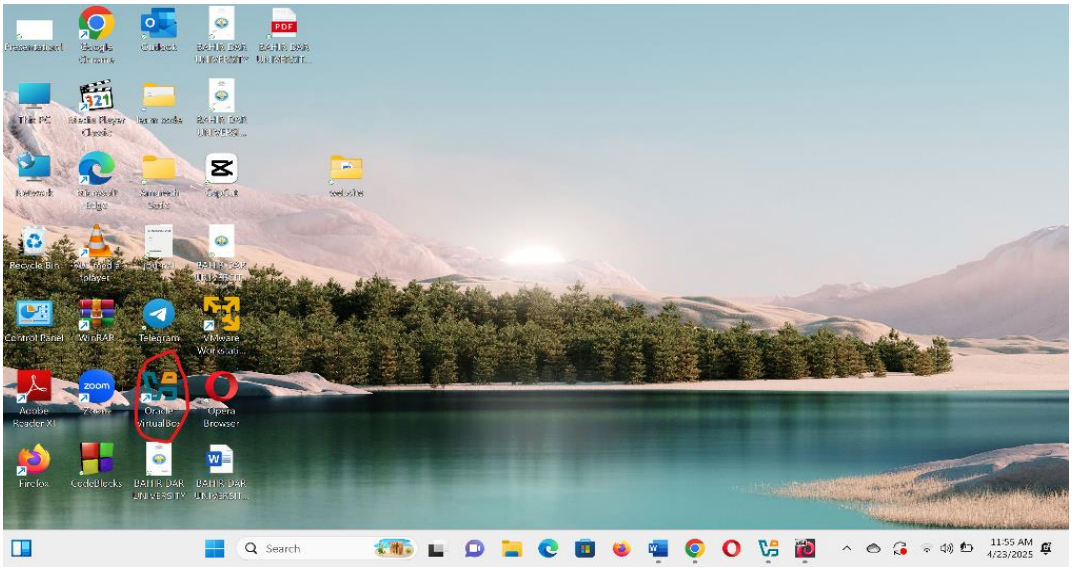
-Full Name: We can enter the full name of the user (e.g., "Alazar Alebel Necho") or leave it blank by pressing Enter.

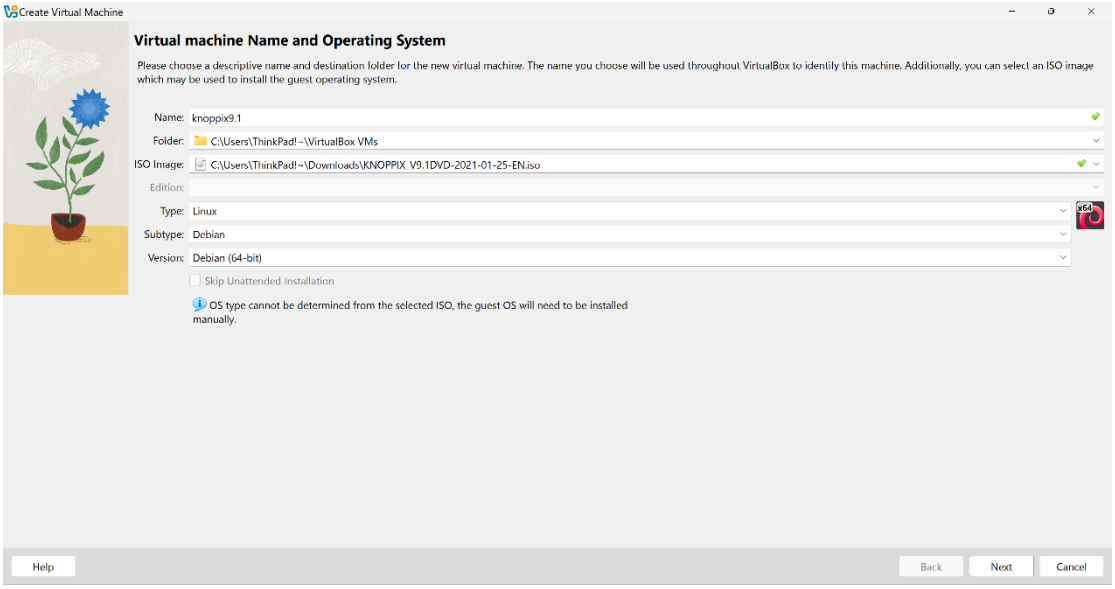
-There are also other optional prompts like room number,work phone,home phone we can just leave them blank.

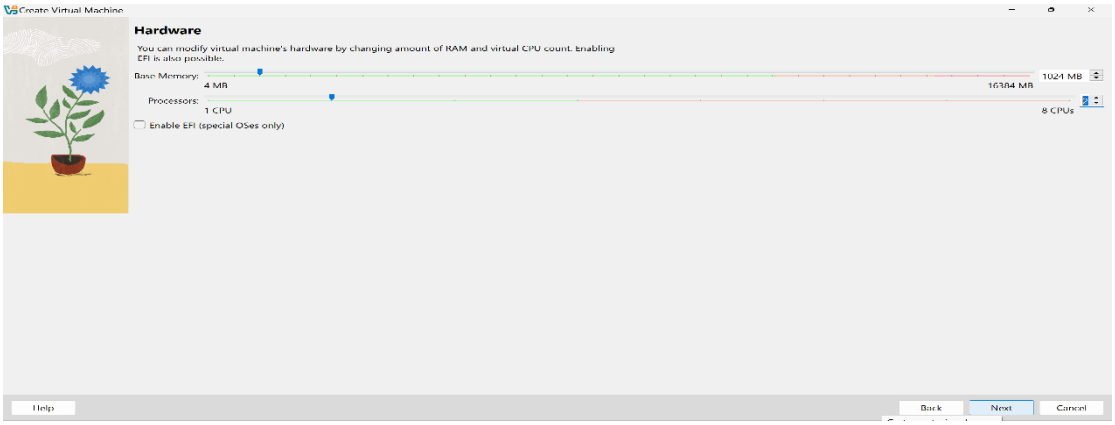
#know I will attach some images of my os.

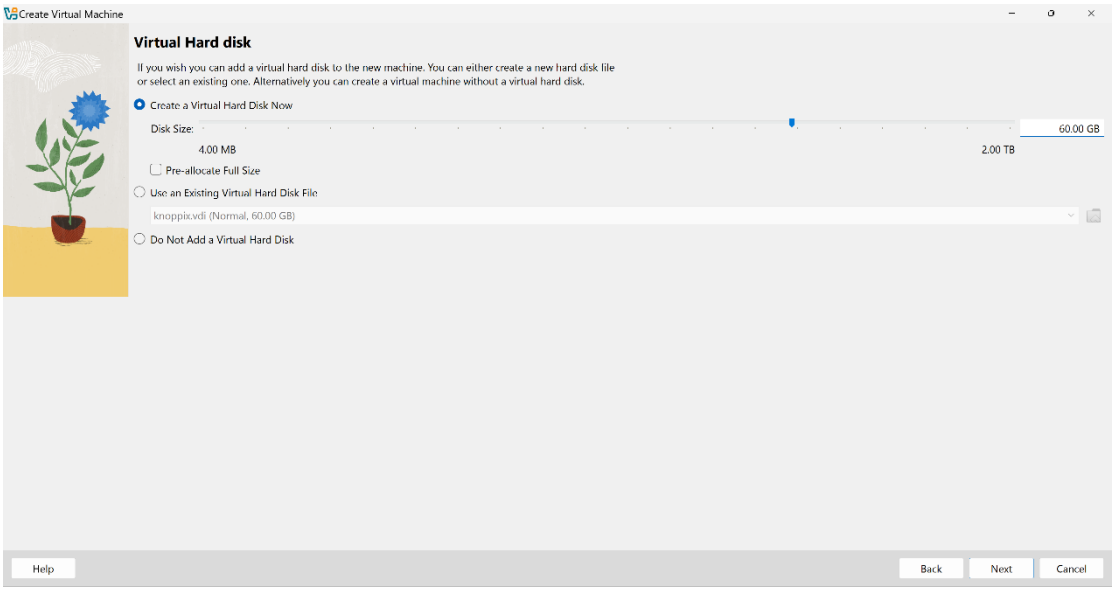


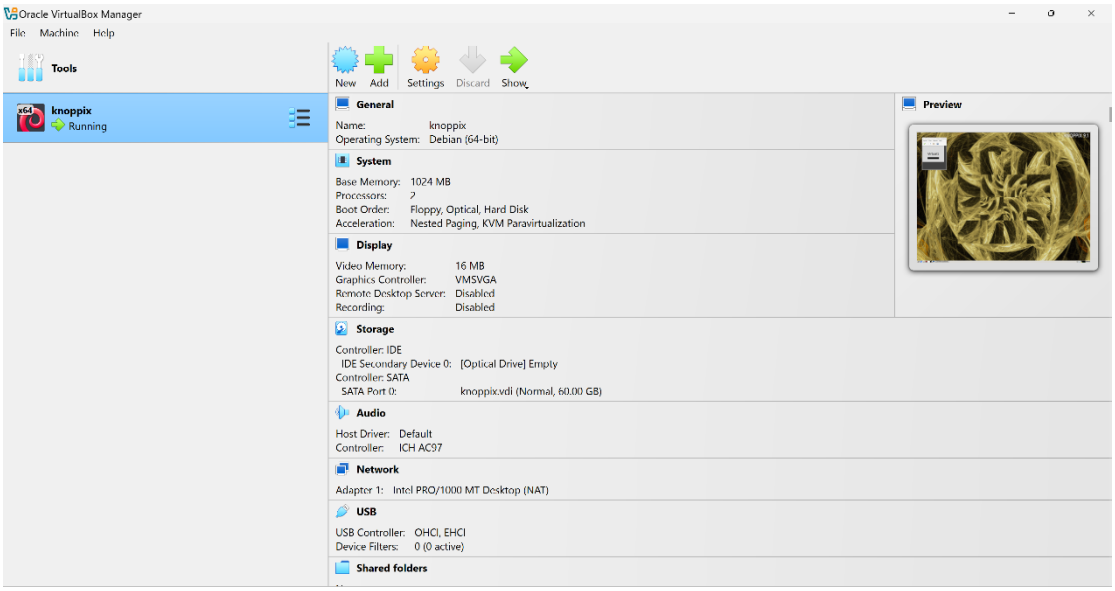


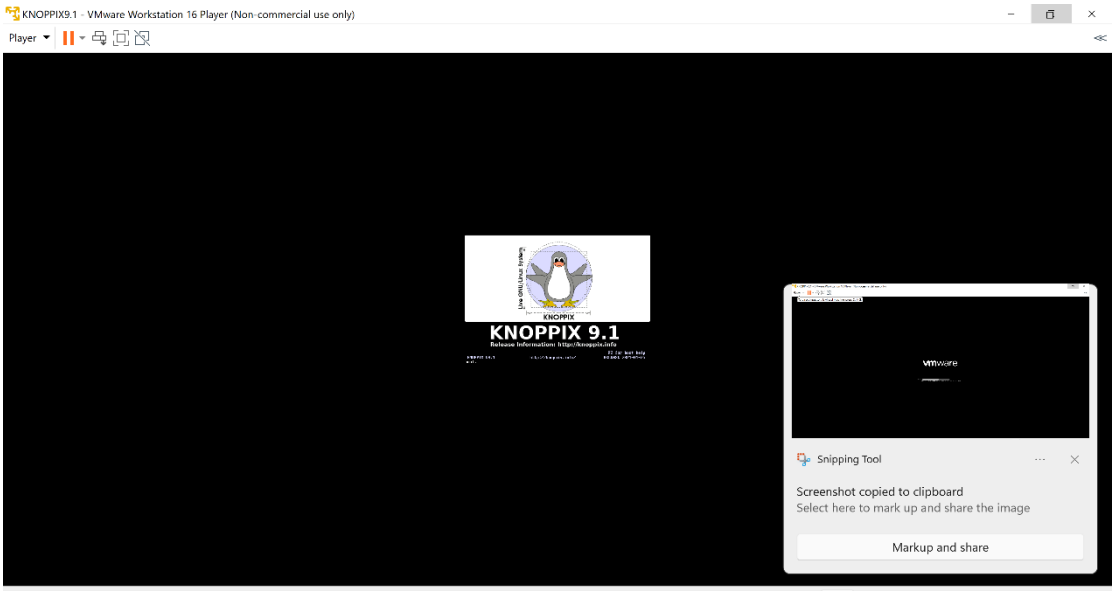

Recycle Bin
Control Panel
WinRAR
Telegram
Adobe Reader XI
Zoom
Opera Browser
Firefox
CodeBlocks
Search
11:55 AM
4/23/2025

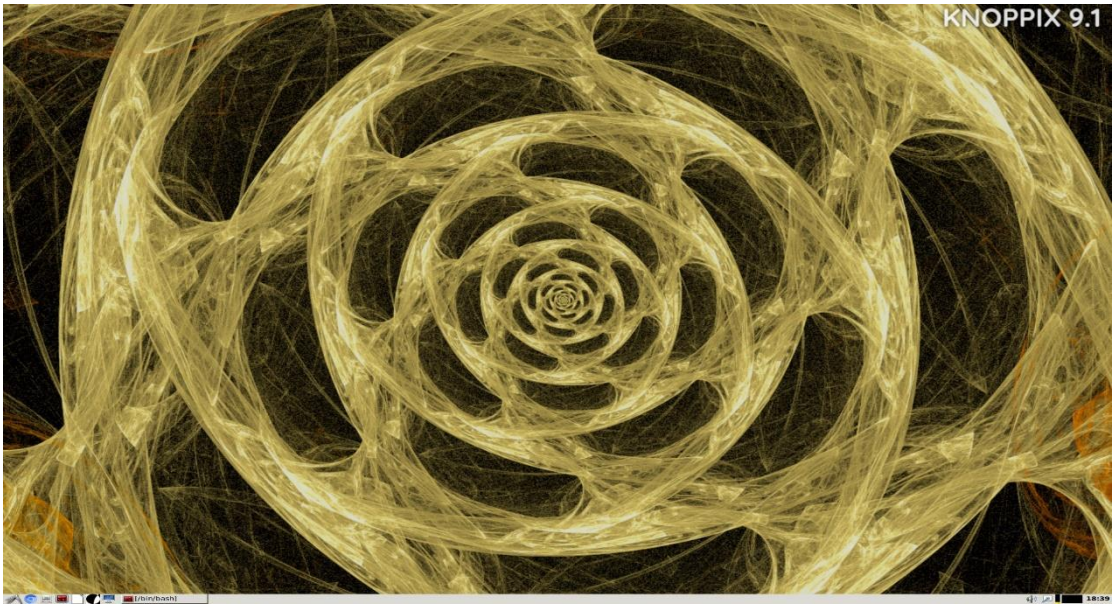

Create Virtual Machine
Virtual machine Name and Operating System
Please choose a descriptive name and destination folder for the new virtual machine. The name you choose will be used throughout VirtualBox to identify this machine. Additionally, you can select an ISO image which may be used to install the guest operating system.
Name: knoppix9.1
Folder: C:\Users\ThinkPad!~\VirtualBox VMs
ISO Image: C:\Users\ThinkPad!~\Downloads\KNOPPIX_V9.1DVD-2021-01-25-EN.iso
Edition:
Type: Linux
Subtype: Debian
Version: Debian (64-bit)
Skip Unattended Installation
OS type cannot be determined from the selected ISO, the guest OS will need to be installed manually.
Help
Back
Next
Cancel

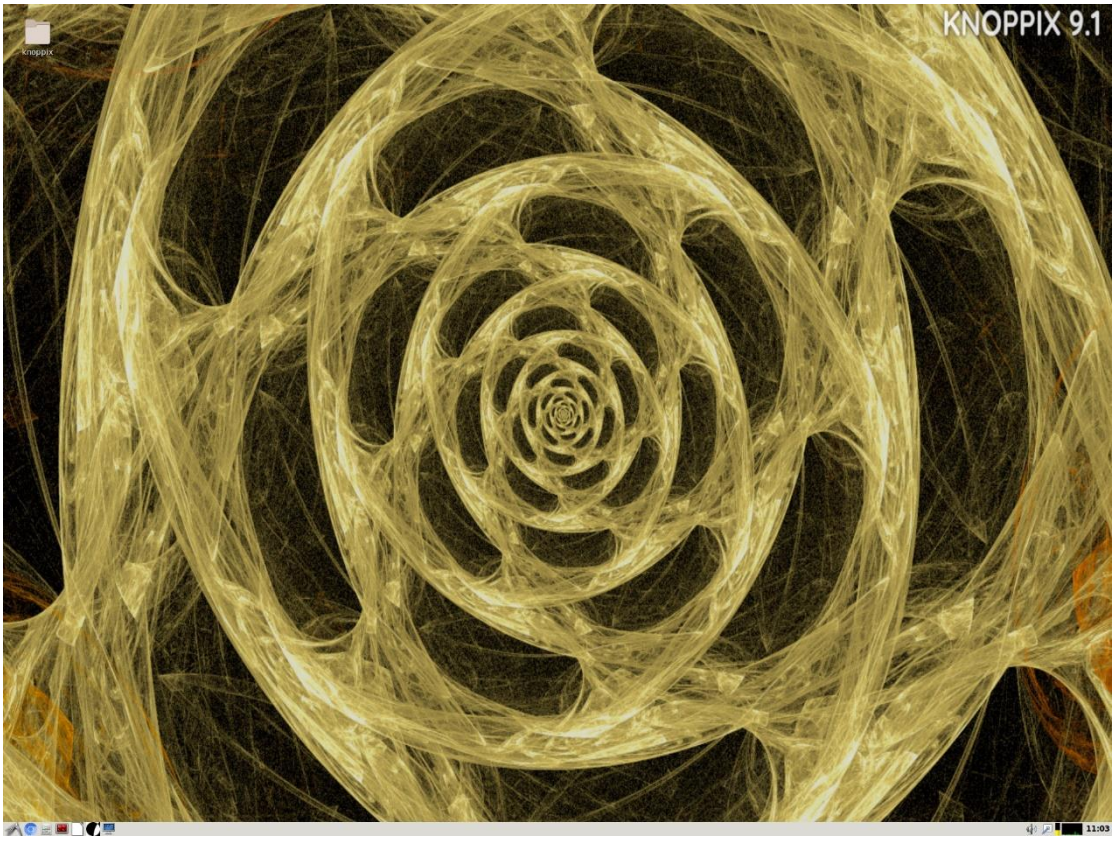

Hardware
You can modify virtual machine's hardware by changing amount of RAM and virtual CPU count. Enabling EFI is also possible.
Base Memory:
4 MB
16384 MB
1024 MB
Processors:
1 CPU
8 CPUs
Enable EFI (special OSes only)
Help
Back
Next
Cancel

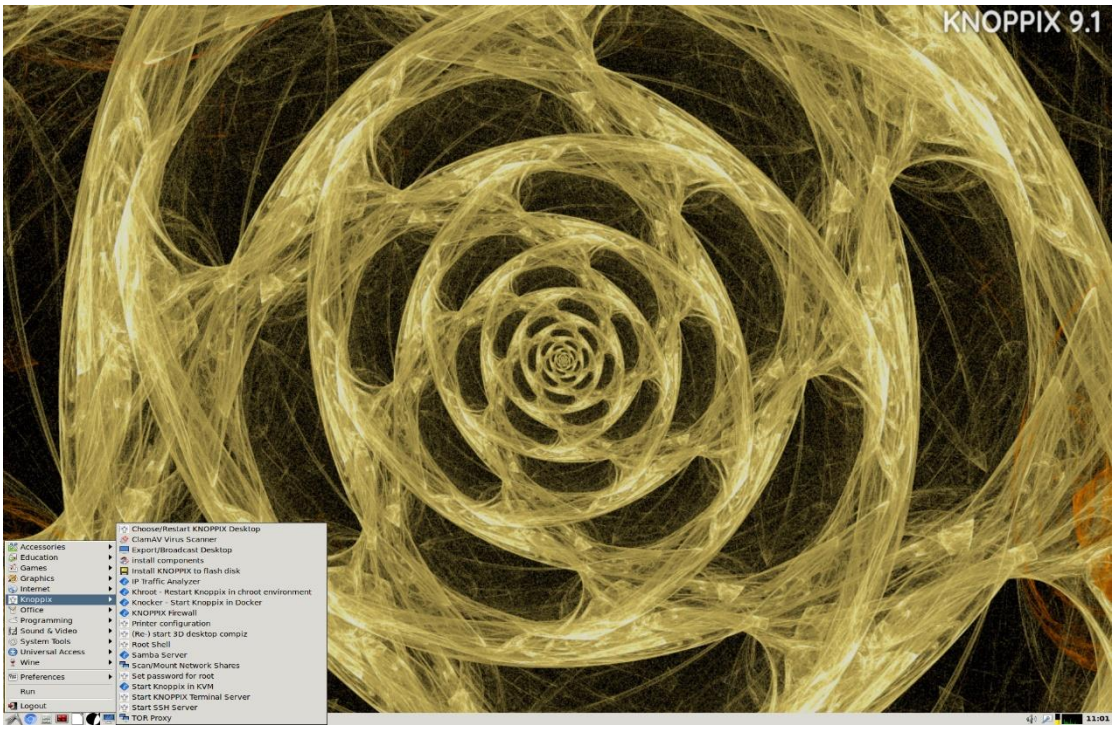

Create Virtual Machine
Virtual Hard disk
If you wish you can add a virtual hard disk to the new machine. You can either create a new hard disk file or select an existing one. Alternatively you can create a virtual machine without a virtual hard disk.
Create a Virtual Hard Disk Now
Disk Size:
60.00 GB
4.00 MB
2.00 TB
Pre-allocate Full Size
Use an Existing Virtual Hard Disk File
knoppix.vdi (Normal, 60.00 GB)
Do Not Add a Virtual Hard Disk
Help
Back
Next
Cancel

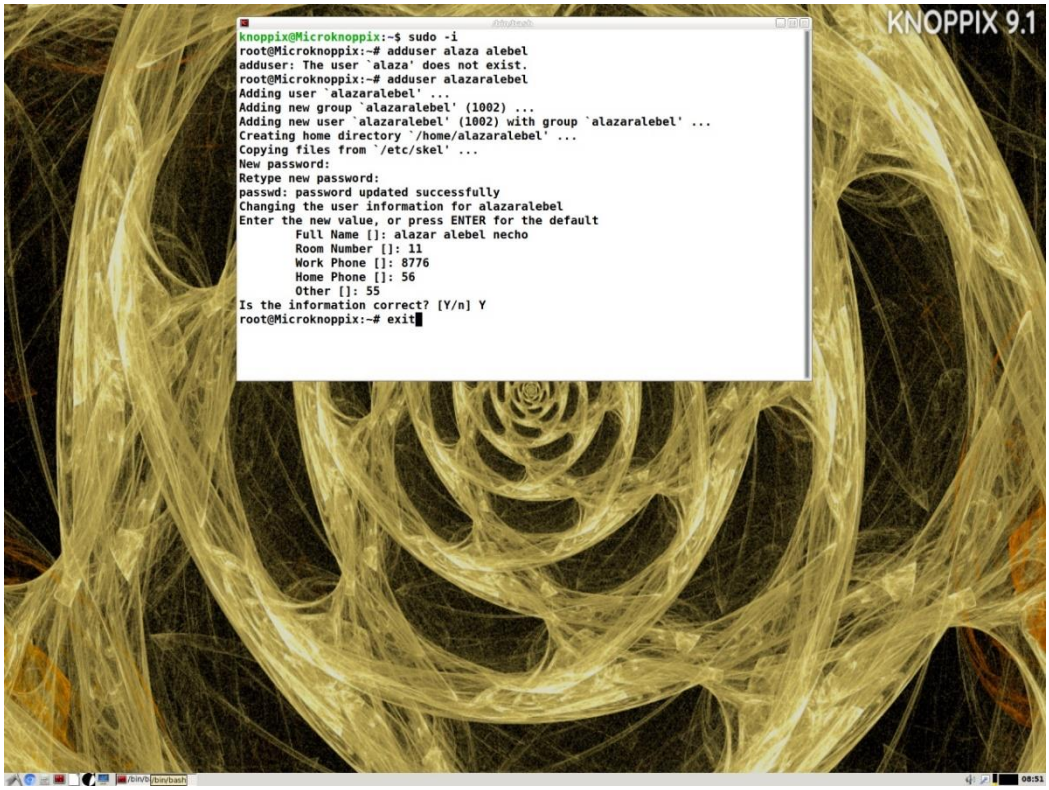

Oracle VirtualBox Manager
File
Machine
Help
Tools
knoppix
Running
New
Add
Settings
Discard
Show
General
Name: knoppix
Operating System: Debian (64-bit)
System
Base Memory: 1024 MB
Processors: 2
Boot Order: Floppy, Optical, Hard Disk
Acceleration: Nested Paging, KVM Paravirtualization
Display
Video Memory: 16 MB
Graphics Controller: VMSVGA
Remote Desktop Server: Disabled
Recording: Disabled
Storage
Controller: IDE
IDE Secondary Device 0: [Optical Drive] Empty
Controller: SATA
SATA Port 0: knoppix.vdi (Normal, 60.00 GB)
Audio
Host Driver: Default
Controller: ICH AC97
Network
Adapter 1: Intel PRO/1000 MT Desktop (NAT)
USB
USB Controller: OHCI, EHCI
Device Filters: 0 (0 active)
Shared folders
Preview


KNOPPIX9.1 - VMware Workstation 16 Player (Non-commercial use only)
Player
KNOPPIX 9.1
Release Information: https://knoppix.info
Snipping Tool
Screenshot copied to clipboard
Select here to mark up and share the image
Markup and share


KNOPPIX 9.1


knoppix
KNOPPIX 9.1
11:03


KNOPPIX 9.1
Accessories
Education
Games
Graphics
Internet
Knoppix
Office
Programming
Sound & Video
System Tools
Universal Access
Wine
Preferences
Run
Logout
Choose/Restart KNOPPIX Desktop
ClamAV Virus Scanner
Export/Broadcast Desktop
install components
Install KNOPPIX to flash disk
IP Traffic Analyzer
Khroot - Restart Knoppix in chroot environment
Knocker - Start Knoppix in Docker
KNOPPIX Firewall
Printer configuration
(Re-) start 3D desktop compiz
Root Shell
Samba Server
Scan/Mount Network Shares
Set password for root
Start Knoppix in KVM
Start KNOPPIX Terminal Server
Start SSH Server
TOR Proxy
11:01



Issues (problem faced):

-Bootloader install fails: The virtual machine fails to boot into Knoppix upon reboot after successful bootloader installation.

Possible Causes:

The bootloader was not correctly installed.

Boot order of the virtual machine is incorrect after installation.

The biggest challenge I faced Is that when creating an account using my name for the question given above I was not able to do it in the installation process.in other operating systems when we install the operating system there is an option asking to create an account through the process but in knoppix I was not able to create my account directly on the process of installation.

Installation Process:

Language Settings:there were the installer defaulting to a German installation even when booting from an English version. i tried a lot to discover the solution for the problem and I actually did not fail.

Solution

-Here the solution for the problem I faced is listed:

I searched for the problem and I got it which is we can actually create user account on the terminal using different commands. These commands are sudo -i to become root user,know can create new user using the command adduser alazar alebel(mine is created using my name) ,so I solved the problem using this technique.It is more described in the section asking about creating user account.For the language I actually lead by the sense of the English language.

Filesystem support

ext4 :

is the successor version of the very widely used ext3 filesystem on Linux. It was designed to improve upon ext3 in various ways, offering greater performance, reliability, and capacity.

Why Knoppix likely supports it:

Ubiquity: ext4 is the standard filesystem for the majority of Linux distributions, including Debian, from which Knoppix originates. What that implies is that it's extremely likely that any kernel modules and tools needed by ext4 will already be included in Knoppix.

Stability and Maturity: It's a mature and stable filesystem, so it is a safe, secure filesystem to use every day.

Features: ext4 includes substantial features such as:

Journaling: It avoids data corruption on system crashes by keeping a journal of outstanding writes.

Larger Filesystem and File Sizes: It supports much larger single files and volumes than its predecessors.

Extents: They give improved performance and reduced fragmentation for large files.

Delayed Allocation: It can improve performance by better allocating disk blocks.

In the situation of Knoppix: Since Knoppix can be used to investigate and control existing systems, support for a regular Linux filesystem like ext4 is needed to read data on Linux partitions.

Btrfs :

Btrfs is a new, copy-on-write (CoW) filesystem for Linux meant to offer advanced capabilities while focusing on fault tolerance, repair, and easy administration.

Why Knoppix likely has it:

Current Linux Feature: As Btrfs is a recent, well-maintained filesystem, all modern Linux distributions come with support for it. Given that Knoppix is intended to be an all-encompassing live system, support for recent filesystems is an advantageous feature.

Advanced Features: Btrfs offers a compelling set of features including:

Copy-on-Write (CoW): When changing data, the original data is not overwritten. Rather, a copy is made, and modifications are written to that copy. This aids in snapshots and data integrity.

Snapshots: we can create read-only or read-write filesystem snapshots so we can return to previous points.

Subvolumes: Btrfs allows us to have several independent filesystems in one partition, also known as subvolumes.

Checksumming: It checksums metadata(data about data) and data to detect and even correct errors.

In Knoppix context: Knoppix being capable of talking to systems with its advanced features makes it a more general-purpose system rescue, analysis, and data recovery tool on existing Linux installations.

In essence, the likely support of ext4 and Btrfs in Knoppix reflects its intent to be a functional and up-to-date Linux environment that will work with a wide variety of Linux systems and their storage models.

ext4 provides a good and universally compatible foundation, while Btrfs provides additional access to newer and feature-rich configurations.

Why?

Relevance of ext4 support in Knoppix:

General Use: ext4 is the default Linux filesystem used by most mainstream distributions (like Debian, which Knoppix uses as its base). Therefore, Knoppix is very likely to encounter and need to handle ext4 partitioned disks.

Data Access: As a live system that is often used for data retrieval or system maintenance, Knoppix needs to be able to read from and possibly write to the filesystems of the systems it is being run on. Not having ext4 support, Knoppix would be unable to retrieve data on myriad Linux installations.

Reliability and Stability: ext4 is a stable, mature filesystem. Incorporating support for it makes it possible for Knoppix to work reliably with these standard Linux partitions.

Relevance of support for Btrfs in Knoppix:

Acceptance of Modern Filesystem: Btrfs is a more advanced, newer filesystem that new Linux distributions are moving towards more. Supporting Btrfs makes Knoppix capable of interacting with such newer systems.

Access to Advanced Functionality: Btrfs supports things like snapshots, copy-on-write, and native RAID support. If a user's system is using these facilities, Knoppix needs Btrfs support to understand and respond to the storage they are occupying. For example, to be able to recover from a snapshot of Btrfs, Knoppix needs to be able to read and edit Btrfs filesystems.

Versatility as a Rescue Tool: Knoppix is an attempt to be an ultimate rescue and utility system. Its support of modern filesystems like Btrfs makes it more able to serve this purpose for more Linux users.

In general terms, the fact that it includes both ext4 and Btrfs makes Knoppix a more capable and useful-ly universal live Linux environment

that can meaningfully interact with a countless majority of Linux systems users might need to work with.

Advantages and Disadvantages

Advantages of Having Knoppix in a Virtual Environment:

Security and Segregation: we can mess with Knoppix, install applications, customize system settings, and even perhaps destroy things without coming in contact with our host operating system.

Convenience and Ease of Use: we can operate Knoppix alongside our present operating system without rebooting. This facilitates us to transfer from our routine work environment to the Knoppix system without any difficulty.

Resource Allocation Control: we have the flexibility to modify the level of RAM, CPU cores, and disk space allocated to the Knoppix virtual machine.it give us chance to modify them.therefore we are able to tailor the environment to our needs and the resources available on our host system.

Simple Backup and Restore: Easy to backup the entire Knoppix installation by duplicating these files. Easy to restore the system as well.

Testing and Development: For system admins or developers, a virtual Knoppix environment is a reproducible and isolated environment on which to test applications, scripts, or configurations.

Learning and Discovery: It is a nice way to experiment with Linux and Knoppix without the inflexibility of installation.we learn about its capabilities and command-line commands from the comfort of our own time.

Hardware Freedom: The virtual machine provides the same hardware abstraction interface to Knoppix regardless of the internal physical hardware on which our machine executes. This can assist in offering consistency.

Network Configuration Flexibility: Virtualization software offers multiple networking modes which allow us to determine how the Knoppix virtual machine should talk to our network and the internet.

Disadvantages of Installing Knoppix in a Virtual Environment

Performance Overhead: Running an operating system within another operating system does generate some performance overhead. Knoppix in a VM can be slightly slower or less responsive than running it natively on real hardware.

Limited Direct Hardware Access: The virtual machine itself acts as an intermediary, which can limit direct access to certain hardware components of our host machine

Resource Contention Ability: In case our host system is already under a load, executing a virtual machine will further drain its resources, potentially resulting in performance issues for both host and guest operating systems.

Configuration Difficulty: While more recent software packages for virtualization have simplified the process of configuration, configuring the network parameters, shared folders, and other advanced features at times becomes somewhat complicated for new users.

Disk Space Utilization: The Knoppix virtual hard disk image will occupy disk space on our host machine. It would depend on the amount of disk space allocated and the amount of data utilized in the virtual machine.

->Overall, running Knoppix in a virtual environment offers a number of significant advantages in terms of safety, convenience, and flexibility for learning, testing, and just exploration. Its major disadvantages are likely to be performance overhead and limited direct hardware access. To the vast majority who want to play with running Knoppix or use it for development and testing, the benefits of virtualization generally outweigh its costs.

Conclusion

In short, the installation of Knoppix in a virtual environment using tools like VMware Workstation or VirtualBox provides an appealing way for us

to have a safe, flexible, and convenient way to explore and utilize this powerful live Linux distribution.

The advantages, such as the isolation of the host system, the ease of taking snapshots, and the ease of backup and restoration, make it an ideal setup for experimentation, training, and even development or testing environments. Though there are compromises, primarily around potential performance overhead and limitations on direct hardware access, these tend to be overbalanced by the benefits for the majority of users.

For someone who is curious about Linux, in need of a temporary or stand-alone environment to get some work done, or a programmer looking for a stable platform to test his stuff out, virtualizing Knoppix offers an efficient and worthwhile approach because it is live linux. This allows us to access Knoppix functionality without the headaches or intrinsic danger presented by a direct install.Lastly, having Knoppix housed in a virtual machine offers a simple and secured place to harness its capabilities.

Future outlook/Recommendation

future opportunities for the installation of Knoppix on virtual environments remain strong and relevant, driven by a number of ongoing trends in computing and end-user requirements.

Future Outlook:

Better Virtualization Software: Virtualization software continues to improve. We can expect that future versions of VMware Workstation, VirtualBox, and other software will deliver even better performance, more seamless integration between host and guest operating systems, and more complete support for diverse hardware and software configurations. This will continue to narrow the performance gap between running Knoppix virtually and natively.

Growing Need for Isolated Environments: As cybersecurity concerns continue to rise, the need for isolated environments to try out potentially risky software or access untrusted websites will only become increasingly important. Virtualized Knoppix is an excellent choice for doing this.

Simpler-to-Use Interfaces: Virtualization software is getting progressively easier to use overall. Later versions will likely have even simpler setup routines and easier-to-use interfaces, making it even more convenient for newcomers to begin virtualizing operating systems like Knoppix.

Recommendations:

For New Users: If we are a newcomer to Linux or Knoppix. It is the safest and most comfortable way to test the waters without causing any damage to our main system. VirtualBox is free and an excellent option.

Explore Guest Additions/Tools: Install the Guest Additions (VirtualBox) or VMware Tools on our Knoppix virtual machine. These packages significantly improve integration with the host system, such as shared clipboard, drag-and-drop file sharing, and better display resolution.

Assign Sufficient Resources: Ensure that we allocate sufficient RAM and CPU cores to our Knoppix virtual machine so that it can run efficiently. The ideal will depend on what we wish to do, but start with at least 2GB of RAM and one or two CPU cores.

Experiment with Networking Modes: Familiarize ourself with the different networking modes (Bridged, NAT, Host-only) that our virtualization software offers and choose the one that best suits our needs for internet access and communication with other computers on our network.

Back Up our Virtual Machine Regularly: Treat our Knoppix virtual machine image like important data and back it up every now and then to prevent data loss in case of host system issues.

Keep Up-to-Date: Keep both our virtualization software and our Knoppix install up-to-date in order to benefit from the latest features, performance improvements, and security patches.

-In short, the virtual world is still a highly recommended and increasingly adapt place to run Knoppix. As virtualization software gets better, it will likely become even more seamless and efficient and further be the platform of preference for more people to use Knoppix.

what, why, and how virtualization in modern operating system?

What is Virtualization?

Virtualization is basically the technology that allows us to run one or multiple virtual instances of an operating system or application on a single piece of physical hardware. Instead of working directly with the physical device, the virtualized environment runs in a software layer that emulates the required hardware. This produces independent and isolated computing environments called virtual machines (VMs).

Why Virtualization?

Virtualization offers a number of strong advantages of new-style computing Optimization of Resources: It allows us to make the most efficient use of expensive hardware. Instead of lots of idle physical servers, we can run a number of VMs on one powerful machine, each serving a different purpose. Personally virtualizations helps me to do my work easily.the purposes are described below:

Isolation and Security: VMs are isolated from each other and the host operating system. That is, if there is a problem in one VM it will not likely spread to the other VMs or the host. This enhances security and stability.

Flexibility and Agility: VM creation, deployment, and management are typically much faster and easier than physical hardware installation. This agility is critical for development, testing, and scaling IT infrastructure quickly.

Cost Savings: Merging multiple physical machines onto fewer physical servers enables organizations to save on hardware acquisition costs, power consumption, cooling, and physical space.

How Virtualization Works:

Virtualization is founded on a software layer referred to as a hypervisor (also Virtual Machine Monitor or VMM). The hypervisor lies between the hardware and the virtual machines, managing resources (CPU, RAM, storage, network) to individual VM.

The hypervisor does several key things:

Resource Allocation: It allocates CPU time, memory, storage, and network bandwidth to each virtual machine.

Hardware Abstraction: It presents a virtualized hardware infrastructure to each VM, concealing the details of the physical hardware.

Isolation: It ensures that each VM has its own separate environment and cannot influence other VMs or the host operating system.