BAHIR DAR UNIVERSITY

FACULITY OF COMPUTING

Department: Software engineering
Course: Operating System and System Programming

Individual assignment

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1. ELIVE OPERATING SYSTEM

INTRODUCTION

Elive (short for *Enlightenment Live*) is a **Debian-based Linux distribution** known for its lightweight performance, elegant design, and efficiency. It is built around the **Enlightenment desktop environment**, which offers a visually rich user interface with minimal system resource usage.

Elive is a free and open-source Linux distribution designed for everyday use, particularly on older or less powerful hardware. It offers a fast, visually appealing, and customizable desktop experience, leveraging the Enlightenment desktop environment. Elive can be run directly from a live DVD or USB, and it also supports persistent memory for saving data and settings while running in a live environment.

Elive is built upon the stable Debian Linux distribution, providing a reliable and well-supported base .Elive utilizes the Enlightenment desktop environment, which is known for its customizable and visually appealing interface, making it a good choice for users who appreciate a visually rich desktop.

Motivations to Download and Install Elive OS

- **Breathe New Life into Old Hardware**
  Got an old laptop gathering dust? Elive can revive it and make it feel brand new ,fast, responsive, and useful again, even with extremely low specs.
- **Unique and Beautiful Desktop Experience**
  Tired of the same old UI? Elive's Enlightenment desktop is like nothing else ,smooth animations, gorgeous effects, and a futuristic vibe, all while using barely any system resources.
- **Blazing Fast Performance**
  Elive boots quickly, runs smoothly, and multitasks well. If speed and responsiveness matter to you, it delivers.
- **Built-in Tools That "Just Work"**
  From system cleaners to rescue utilities, Elive includes a ton of smart, built-in tools to help you maintain and optimize your system saving you time and effort.
- **No Installation Required (Live Mode)**
  You don't have to commit right away. You can run Elive entirely from a USB drive, test everything, and decide later with no changes made to your computer.
- **Geek-Friendly and Customizable**

If you like to tinker, script, or personalize everything Elive gives you the tools and freedom. It's minimal, elegant, and super configurable under the hood.

- **Portable and Persistent**
  Install it on a USB stick and carry your full desktop (with files, apps, settings) in your pocket. Great for techs, travelers, and digital nomads.
- **Automated Help Features**
  Elive comes with intelligent automation: if something breaks, a built-in script might already know how to fix it. That's peace of mind built into the OS.
- **Secure, Private, and Lightweight by Design**
  Based on Debian, Elive avoids bloat, unnecessary background processes, and telemetry — a great choice if you care about performance and privacy

Objectives:-why we install Elive operating system?

The primary objective of installing **Elive OS** is to **gain hands-on experience with a lightweight, efficient, and visually appealing Linux distribution** that is optimized for both old and modern hardware. This process helps develop practical skills in operating system installation, virtualization, and system configuration.

But there are also some specific objectives to:-

1) **Understand OS Installation in Virtual Environments**
   - Learn how to install an operating system using tools like **VMware Workstation** or **Virtual Box**

2) **Explore Lightweight Linux Systems**
   - Discover how **Elive**, as a lightweight OS, utilizes fewer system resources while maintaining good performance.

3) **Familiarize with the Enlightenment Desktop Environment**
   - Gain experience with a **non-traditional Linux desktop environment** that emphasizes both speed and aesthetics.

4) **Learn File `system and Partitioning Concepts**
   - During installation, understand Linux file systems like **ext4**, and how they are used in real-world systems.

5) **Develop System Troubleshooting Skills**
   - Identify and solve problems that occur during installation, driver setup, or system performance.

6) **Enhance Technical Documentation Skills**
   - Practice writing detailed documentation including installation steps, issues faced, and solutions applied.

7) **Prepare for System Programming and Shell Scripting**
   - Set up a development-friendly Linux environment to perform later tasks

involving **system calls** and **shell scripts**

Hardware and software requirements

Hardware requirements:-

Minimum System Requirements:

- **Processor:** 1 GHz CPU (x86 or x86_64 architecture)
- **RAM:** 512 MB of RAM (1 GB recommended for smoother performance)
- **Storage:** 4 GB of available disk space (more recommended for additional applications and files)
- **Graphics:** Basic graphics card with support for at least 1024x768 resolution
- **Optical Drive:** DVD drive or USB boot support for installation

Recommended System Requirements:

- **Processor:** Dual-core CPU (2 GHz or faster)
- **RAM:** 2 GB or more for better multitasking and smoother performance
- **Storage:** 10 GB or more for a comfortable installation experience
- **Graphics:** A modern graphics card with support for hardware acceleration (preferably for smoother visuals with Enlightenment)
- **Sound:** Sound card (if you want to use audio features)

Software Requirements:

- **Base System:** Elive is based on Debian, so it uses standard Debian repositories for package management.
- **Desktop Environment:** Enlightenment (E17 or E22 depending on the version of Elive)
- **File System:** Supports ext4, btrfs, and other common Linux file systems
- **Internet Access:** Optional, but highly recommended for updates and software installation
- **UEFI/BIOS:** Compatible with both legacy BIOS and UEFI systems, though older systems may require BIOS mode.

Optional Software:

- **Web Browser:** You can install browsers like Firefox, Chromium, etc.
- **Office Software:** LibreOffice or any other office suite can be installed.
- **Media Player:** VLC, MPV, or other media players can be added.
- **Development Tools:** Install compilers, IDEs, or other development-related software.

Installation steps:-

1. Download Elive ISO

- Go to the official Elive website.
- Choose the version you want (Stable or Beta) and download the ISO file.
- Note: The Stable version is older but more tested; the Beta is more modern.

2. Create a Bootable USB Drive

- Use tools like:
- **Rufus** (Windows)
- **Etcher** (Windows/Mac/Linux)
- **UNetbootin** or `dd` (Linux command line)
- Select the Elive ISO file and your USB device to create a bootable drive.

3. Boot From the USB

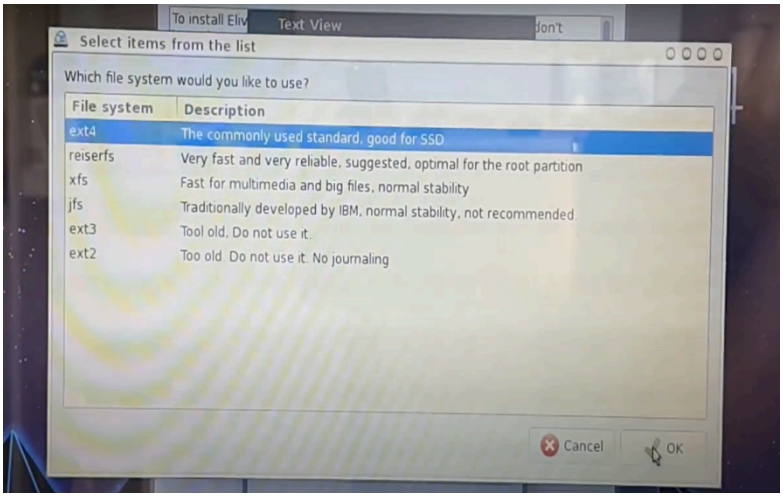
- Insert the USB into your target computer.
- Reboot and enter the BIOS/UEFI (usually by pressing `F2`, `F12`, `DEL`, or `ESC`).
- Set USB as the first boot device.
- Save and exit BIOS — your system should now boot into Elive.

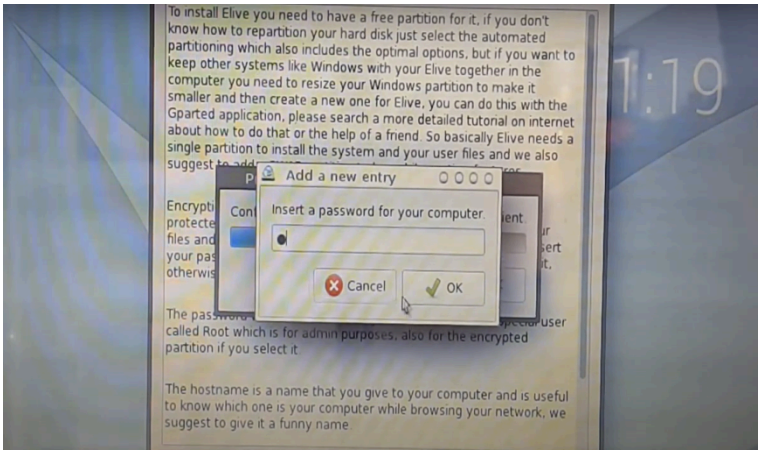
4. Try Elive (Optional)

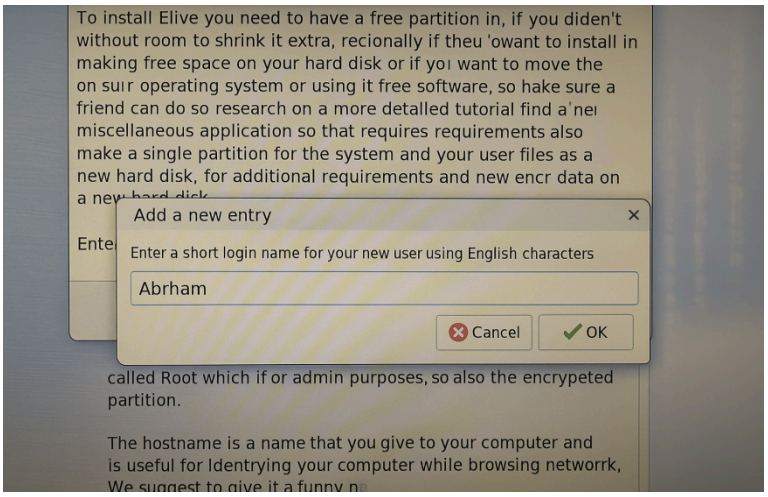
- Elive will boot into a Live Session.
- You can explore the OS without installing it.
- If everything looks good, click on **"Install Elive"** on the desktop or in the menu.

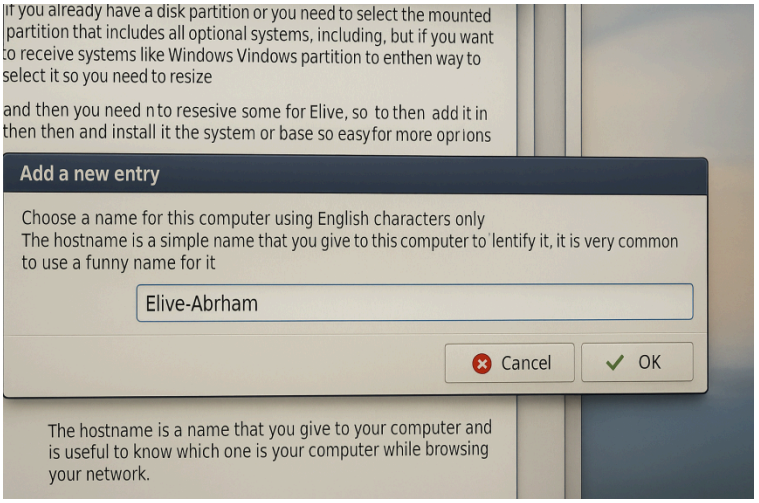
5. Start the Installer

- Choose your preferred language and keyboard layout.
- Set your location/time zone.
- Create a user account and set a password.
- **Disk partitioning**:
- Choose automatic if you're unsure (it can erase your entire disk).
- Or manually partition if you need dual boot or custom layouts.


To install Eliv
Text View
don't
Select items from the list
Which file system would you like to use?
File system
Description
ext4
The commonly used standard, good for SSD
reiserfs
Very fast and very reliable, suggested, optimal for the root partition
xfs
Fast for multimedia and big files, normal stability
jfs
Traditionally developed by IBM, normal stability, not recommended
ext3
Tool old, Do not use it.
ext2
Too old. Do not use it. No journaling
Cancel
OK

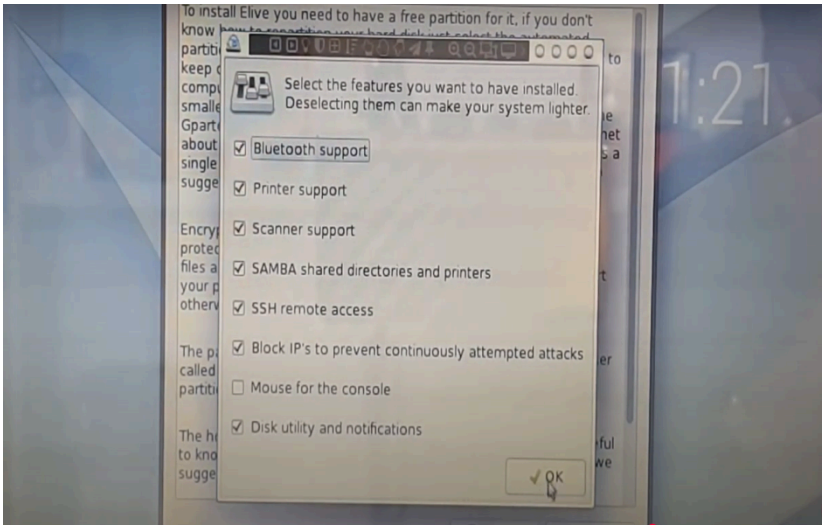

To install Elive you need to have a free partition for it, if you don't know how to repartition your hard disk just select the automated partitioning which also includes the optimal options, but if you want to keep other systems like Windows with your Elive together in the computer you need to resize your Windows partition to make it smaller and then create a new one for Elive, you can do this with the Gparted application, please search a more detailed tutorial on internet about how to do that or the help of a friend. So basically Elive needs a single partition to install the system and your user files and we also
Add a new entry
Insert a password for your computer.
Cancel
OK
called Root which is for admin purposes, also for the encrypted partition if you select it
The hostname is a name that you give to your computer and is useful to know which one is your computer while browsing your network, we suggest to give it a funny name

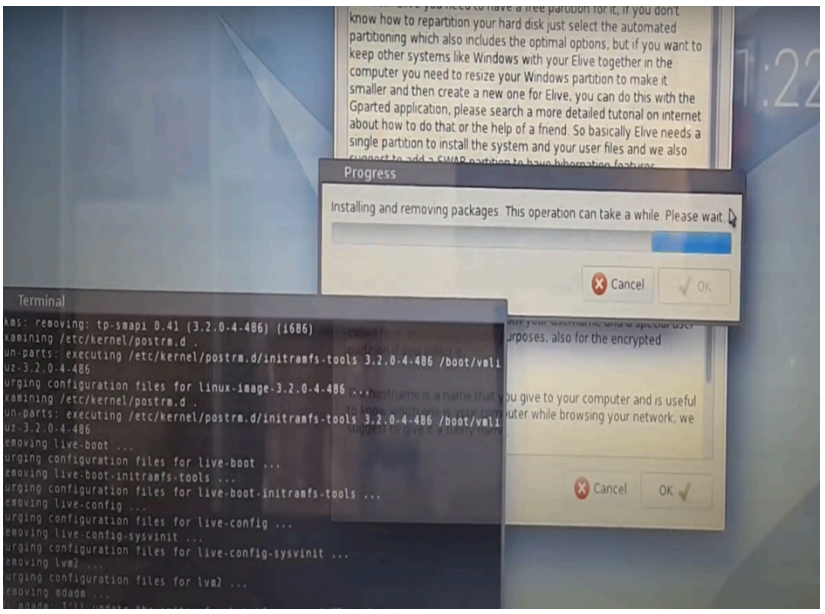

To install Elive you need to have a free partition in, if you diden't without room to shrink it extra, recionally if theu 'owant to install in making free space on your hard disk or if yoı want to move the on suır operating system or using it free software, so hake sure a friend can do so research on a more detalled tutorial find aˈneı miscellaneous application so that requires requirements also make a single partition for the system and your user files as a new hard disk, for additional requirements and new encr data on
Add a new entry
Enter a short login name for your new user using English characters
Abrham
Cancel
OK
called Root which if or admin purposes, so also the encrypeted partition.
The hostname is a name that you give to your computer and is useful for Identrying your computer while browsing networrk,



6. Install Elive

- The installer will copy files and configure the system.
- This may take a while depending on your hardware.
- Once done, you'll be prompted to remove the installation media and reboot.





7. Post-Install Setup

- Login with your credentials.
- Update the system:

Problem faced during installation

- Hard ware compatibility
- Internet connection problem

Solution

- Use old desktops
- Connect the internet through broadband (Ethernet) cable

File systems that are supported by Elive os

Supported by Elive OS (Linux):

File System	Supported?	Read/Write?	Notes
ext4	Yes	Read/Write	Default Linux file system; best for Elive installs.
Btrfs	Yes	Read/Write	Advanced Linux file system with snapshot support.
FAT32	Yes	Read/Write	Universal support; great for USB drives.
exFAT	Yes (needs package)	Read/Write	Supported via `exfat-fuse` or `exfatprogs`. Useful for large files on USBs.
NTFS	Yes (via ntfs-3g)	Read/Write	Microsoft's file system; used for Windows drives.
HFS+	Partial	Read / Limited Write	macOS legacy format; read OK, write needs extra setup and may be unstable.

Not Natively Supported or Limited Use:

File System	Supported?	Read/Write?	Why Not Fully Supported?
ZFS	Optional	With modules	Not included by default due to licensing (CDDL vs GPL). Needs manual install.
APFS	No (mostly)	Read-only at best	Apple's current file system; very limited support on Linux. Reverse-engineered drivers exist but are experimental

But the best supported file systems by elive os are

- ✔ **ext4** (for Linux root)
- ✔ **FAT32/exFAT** (for sharing files with Windows/macOS)
- ✔ **NTFS** (for accessing Windows drives)

The rests are supported with caution example:-

Btrfs (good but complex)

ZFS (install manually, advanced)

HFS+ (macOS old format)

APFS (macOS new format – avoid)

Why some files are supported but not some others

Here are five reasons why some file systems are supported and others are not in Elive OS:-

1. Open Source vs. Proprietary:
   Linux and its derivatives like Elive OS primarily focus on open-source technologies. File systems like NTFS (used in Windows) are proprietary, and while there are open-source libraries to access them, native support isn't usually a priority.
2. Community Support and Development:
   The development of file system support in Linux is often driven by the community. For file systems that are widely used and have active development, there's more incentive for developers to ensure compatibility.
3. Performance and Efficiency:
   Some file systems might be designed for specific hardware or use cases. If a file system doesn't offer good performance or efficiency on typical hardware or storage devices, it may not be a priority for inclusion.
4. Feature Compatibility:
   Linux kernel developers need to ensure that the supported file systems work well with other parts of the operating system, including system calls and libraries. Some older or less common file systems may not have the necessary features or APIs to integrate seamlessly.
5. Security Considerations:

File systems have different security models, and some may have known vulnerabilities or security concerns. Linux kernel developers might choose to prioritize support for more secure and robust file systems to protect against data corruption or potential exploits

Advantage and disadvantage of Elive os

Advantages of Elive OS

- **Lightweight & Fast**
  Runs smoothly on very old hardware, even with as little as 256MB of RAM.
- **Enlightenment Desktop**
  Unique, eye-catching, and efficient desktop environment with low resource usage.
- **Low Resource Usage**
  Excellent for battery life and performance; barely uses RAM or CPU.
- **Pre-installed Utilities**
  Comes with multimedia, maintenance, and productivity tools ready to go.
- **Live Mode Support**
  Try the OS without installing it — great for testing or repairing other systems.
- **Debian-Based Stability**
  Built on Debian, which means access to a huge library of packages and strong reliability.
- **Persistent USB Support**
  Can run from a USB drive with changes saved across reboots — ideal for portability.
- **Aesthetic Customization**
  Highly customizable with themes, animations, and desktop effects.
- **Helpful Automation Scripts**
  Includes tools to clean the system, fix issues, and optimize performance automatically

Disadvantages of Elive OS

- **Small Community**
  Not as popular as other Linux distros, so support and tutorials are more limited.
- **Unfamiliar Desktop Environment**
  Enlightenment may feel too different if you're used to GNOME, KDE, or XFCE.
- **Installer Isn’t Beginner-Friendly**
  The installation process can be confusing for Linux newcomers.
- **Slow Development Cycle**
  Maintained by a small team, so updates and fixes may take time.
- **Beta Version Instability**
  The newer version is more modern but still technically in beta and may be unstable.
- **Not Gaming-Focused**
  Doesn’t come with gaming tools like Steam pre-installed (but you can add them manually).
- **Licensing Restrictions**
  Some proprietary formats (like DVD playback) may require extra steps to set up.

Conclusion About Elive os

Elive OS is a remarkable Linux distribution that offers a unique blend of elegance, speed, and efficiency, especially tailored for those looking to revive older or low-resource computers. Built on the rock-solid foundation of Debian, Elive combines performance with visual appeal by utilizing the Enlightenment desktop environment, which delivers eye-catching effects and a futuristic look without taxing your system's resources. This makes Elive especially attractive for users who want their systems to feel both fast and modern — even on hardware that's over a decade old.

One of Elive's most compelling motivations is its ability to transform underpowered or outdated hardware into functional, responsive machines. For users who value minimalism, performance, or even digital sustainability, Elive offers a highly optimized and polished environment that doesn't compromise on user experience. Whether you're installing it on an old laptop, running it from a live USB, or creating a persistent portable OS, Elive is built for flexibility and practicality.

The operating system supports a wide range of file systems, including ext4 (the Linux default), FAT32, exFAT, and NTFS — making it compatible with Windows and USB drives. More advanced file systems like Btrfs and ZFS are also supported with additional configuration, offering versatility for power users.

However, Elive isn't without its drawbacks. As a niche distro with a small developer team and community, users may find limited online support and slower update cycles compared to more mainstream Linux distributions like Ubuntu or Fedora. Its Enlightenment desktop, while beautiful and efficient, might be unfamiliar to users who are used to more popular environments like GNOME, KDE, or XFCE. The installer process can be less intuitive for beginners, and while the system includes many helpful automation tools, it may require a bit more manual effort to customize or troubleshoot in some cases.

Recommendations for the Future Development of Elive OS

- **Improve Installation Process**
  Elive's current installer is powerful but not beginner-friendly. A more intuitive graphical installer would greatly improve accessibility for new Linux users.
- **Expand Desktop Choices**
  While Enlightenment is the identity of Elive, offering optional lightweight desktops like XFCE or LXQt could broaden its appeal and user base.
- **Strengthen Community and Documentation**
  Investing in better documentation, tutorials, forums, and community engagement would help attract new users and developers, while also supporting existing ones.
- **Enhance Compatibility with Modern Hardware**
  Improving support for recent drivers (Wi-Fi, graphics, touchpads, etc.) will ensure Elive is usable on both old and newer devices.
- **Introduce Software Center or Flatpak Support**
  Adding a simplified app installation experience using Flatpak or App Image would make software access easier, especially for less technical users.
- **Create a Clear Development Roadmap**
  Publishing a roadmap with planned features, updates, and goals can inspire confidence in users and invite contributions from the open-source community.
- **Modern Look Without Losing Performance**

Elive already offers a stunning UI, but continued improvements to UI polish — like better scaling on HiDPI displays and touch support — would enhance modern appeal without sacrificing performance.

- **Focus on Use-Case Specific Variants**
  Specialized versions for education, digital art, or privacy-focused use could make Elive more purposeful and distinguish it from generic Linux distros

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2.Virtualization in modern operating system

(I) what is virtualization in modern operating system?

Virtualization is a technology that allows you to create multiple simulated environments or dedicated resources from a single physical hardware system. In simpler terms, it enables you to run multiple virtual instances of operating systems or applications on a single physical machine, which enhances efficiency, flexibility, and scalability.

Virtualization allows one physical computer (host) to run multiple **virtual machines** (VMs), each with its own operating system and applications.It is often used in servers, data centers, and cloud computing to maximize the use of hardware resources.

Operating System Virtualization (also known as **Containerization**):

- In this case, the operating system is virtualized, not the hardware. Multiple isolated user spaces (containers) are created, all running on the same OS kernel.
- Examples include Docker and Kubernetes.
- It's more lightweight compared to hardware virtualization, as containers share the host OS's kernel but still provide isolation

(II) why we use virtualization In modern operating system

We use virtualization in modern operating system for the following reasons

1. Efficient Resource Utilization:

- Virtualization allows multiple operating systems or applications to run on a single physical machine (host). This maximizes the use of the system's hardware resources (CPU, memory, storage), as the resources are divided among virtual machines (VMs) or containers, instead of leaving some of the physical hardware idle.

2. Isolation:

- Each virtual machine or container runs independently, meaning one VM or application doesn't interfere with the others. This isolation is critical for security and stability, as a crash or security breach in one VM won't affect the others.

3. Testing and Development:

- Virtualization is widely used in software development and testing. Developers can create and test applications in isolated virtual environments, simulating different OS configurations without needing multiple physical machines. It also enables testing in real-world conditions while avoiding conflicts between different versions or setups.

4. Cost Savings:

- By running multiple virtual machines on a single physical system, businesses can reduce the need for multiple physical servers. This lowers hardware, energy, and maintenance costs while improving space utilization.

5. Scalability and Flexibility:

- Virtualization allows easy scaling of resources. As demand for resources (like processing power or memory) increases, more virtual machines can be provisioned quickly on the same hardware. Additionally, it's easy to move virtual machines between different physical servers or cloud environments, providing flexibility and elasticity.

6. Disaster Recovery:

- Virtualized environments are easier to back up and restore than physical systems. Virtual machines can be quickly cloned, snapshot, or migrated, making disaster recovery and business continuity more efficient.

7. Security and Sandboxing:

- Virtualization helps improve security by sandboxing applications or services in isolated environments. This containment reduces the risk of one compromised VM affecting others and helps limit the damage in case of a security breach.

(III) How it works in modern operating system

🎬 **Starting the Hypervisor**:

- On boot, the host system loads the hypervisor (Type 1 or Type 2), which starts managing the physical hardware.
    - **Type 1 (Bare-Metal Hypervisor)**: Runs directly on the physical hardware (e.g., VMware ESXi, Microsoft Hyper-V). It does not rely on a host OS.
    - **Type 2 (Hosted Hypervisor)**: Runs on top of a host operating system, which then manages the virtual machines (e.g., VMware Workstation, Oracle VirtualBox.

🎬 **Creating Virtual Machines**:

- The hypervisor creates and allocates virtual resources (CPU, RAM, storage) to each virtual machine. Each VM gets its own virtual hardware and a separate OS installation.

🎬 **Launching the Guest OS**:

- Inside each VM, the guest OS is launched. The guest OS believes it's running on dedicated hardware, but in reality, the hypervisor is managing the resources.

🎬 **Running Applications**:

- Applications inside VMs (or containers) run like they would on any physical machine. They are isolated from each other, and the hypervisor ensures that one VM's operations do not interfere with another's.

🎬 **Managing VM Resources**:

- The hypervisor continually manages the distribution of resources, allocating more or less CPU, RAM, and storage to each VM based on demand. For instance, a VM that is running a resource-heavy application might temporarily get more resources