Lab 2
CS 5-1 - BSCS – Operating System Lab

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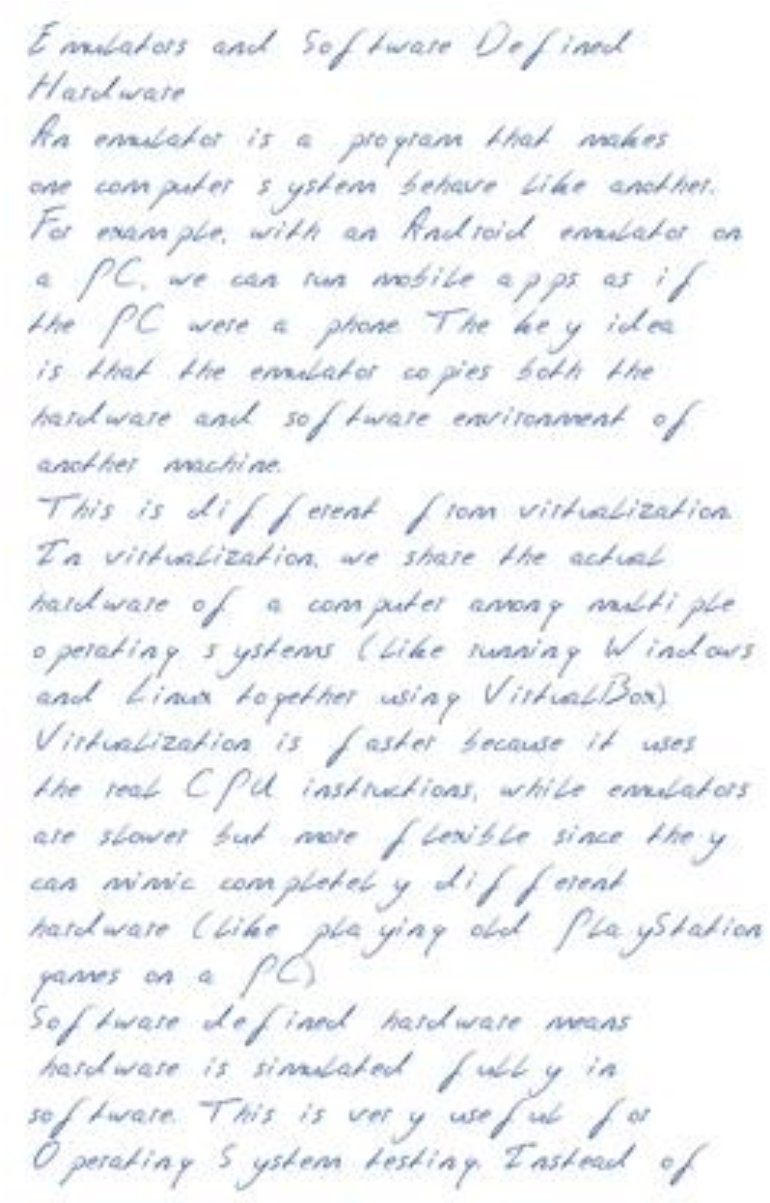
Task1 — Emulators & Software-Defined Hardware



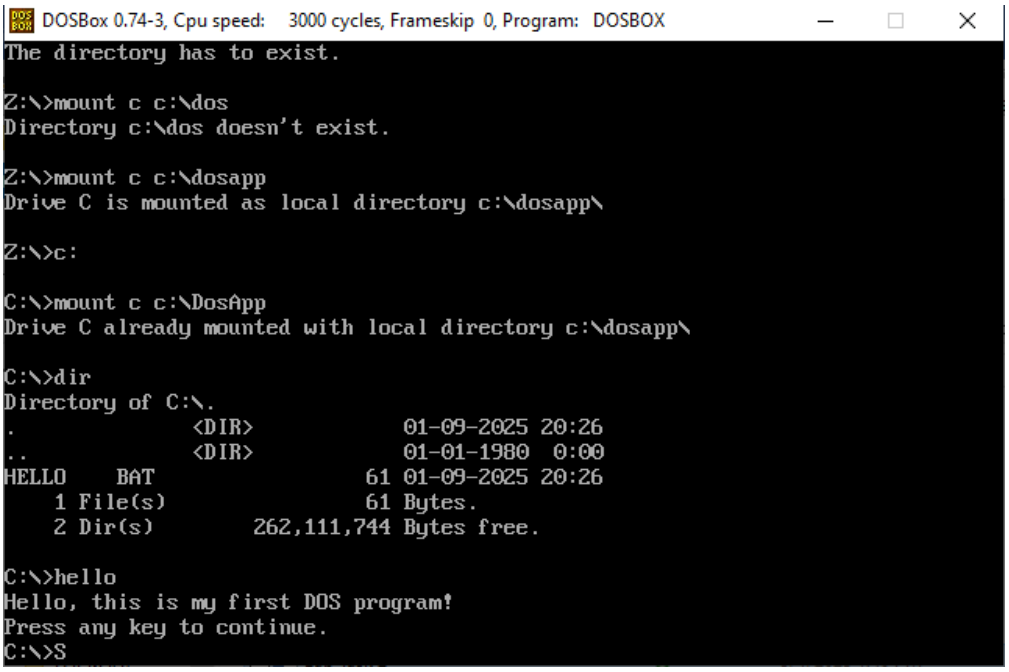
Emulators and Software Defined Hardware

An emulator is a program that makes one computer system behave like another. For example, with an Android emulator on a PC, we can run mobile apps as if the PC were a phone. The key idea is that the emulator copies both the hardware and software environment of another machine.

This is different from virtualization. In virtualization, we share the actual hardware of a computer among multiple operating systems (like running Windows and Linux together using VirtualBox). Virtualization is faster because it uses the real CPU instructions, while emulators are slower but more flexible since they can mimic completely different hardware (like playing old PlayStation games on a PC).

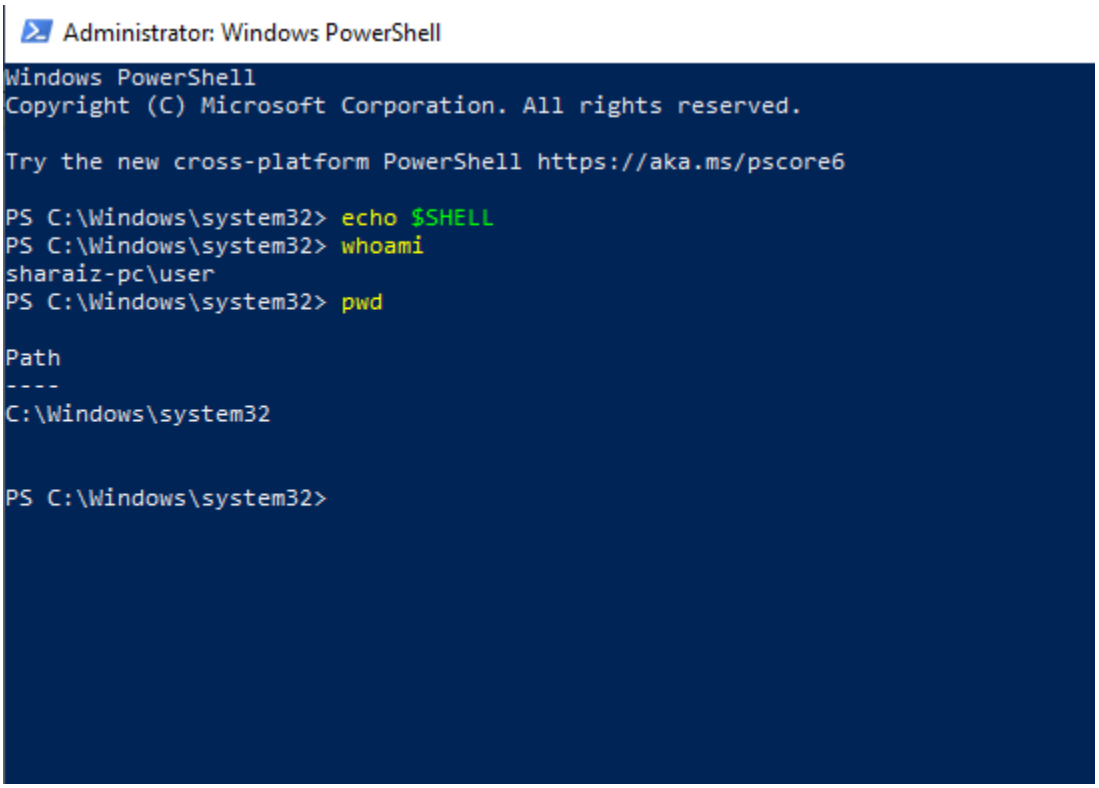
Software defined hardware means hardware is simulated fully in software. This is very useful for Operating System testing. Instead of

needing real machines for every test, developers can create virtual hardware setups (CPUs, memory, devices) inside software and install test the OS there. This saves cost, avoids hardware damage, and allows repeatable testing in controlled environments.
controlled environments.

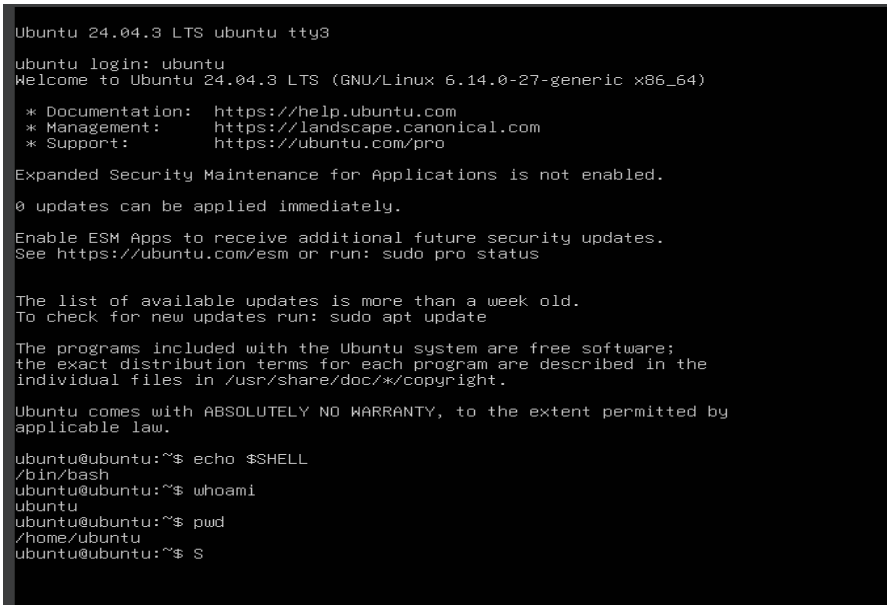


Task 2 — Shell & Terminal Relationship

Shell:



TTY:



Shell & Terminal Relationship
A terminal is just an interface that lets us interact with the system. The GUI terminal is a terminal emulator, while a TTY is a real text console provided by the OS.

A shell e.g. Bash is the program that actually interprets our commands inside the terminal. For example, when we type `pwd`, the shell translates it into system calls that the OS understands.

Importance of Shells:
Shells are important in OS design because they provide a command-line interface (CLI) for controlling processes, managing files, and interacting directly with the kernel. They allow scripting, automation, and system management, which makes them powerful for both users and administrators.

Task 3 — Remote Access & SSH

List of SSH Commands used:

- ssh student@127.0.0.1 – For connecting to a local or remote system.
- scp file.txt student@127.0.0.1:/home/student/ - Copies file from local to remote
- ssh-keygen – This generate SSH key pair.
- ssh-copy-id student@127.0.0.1 – It will copy public key to server
- ssh student@127.0.0.1 – This will connect it without password.

Secure Remote Login with SSH:

SSH (Secure Shell) is a tool that lets us safely connect to another computer over a network. It is mostly used to log in to remote systems and move files from one machine to another.

- Encryption: Everything you type or send is scrambled, so no one can spy on your passwords or commands.
- Authentication: SSH checks that you are really you and that the server you're connecting to is the right one.
- Integrity: It makes sure that whatever you send (like commands or files) is not changed or broken along the way.

Because of these reasons, SSH is one of the safest and most trusted ways to manage computers from far away, share files, and run scripts.