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Input/Output Research Activity

# I/O Software Layers

## Interrupt Handlers

Interrupts are events that stop/pause current programs to execute other tasks. There are both hardware and software interruptions, sent from certain hardware or processes running on the OS. In Linux, the kernel needs to be able to handle three kinds of interruptions: software, hardware, and exceptions. Hardware interrupts are when devices need to interact with the CPU, software interrupts allow processes to communicate with each other, and exceptions are whenever the CPU executes a command that leads to a failure. A simple example of this could be an abort type exception where the physical ram hardware is damaged or if the configuration is incorrect.

## Device Drivers

A device driver is a program without a user interface. Its purpose is to manage hardware components/peripherals and allow them to function correctly with the computer. Another simple example are device drivers for accessing storage systems like network-attached storage, USB drives, and hard drives.

## Device-Independent I/O Software

Even though some of the I/O software is specific to a said device, other parts are device independent. The exact boundary/difference between drivers and device-independent software is system dependent because functions that can be done in a device-independent way could be completed in the drivers. Some functions that are usually done in device-independent software are interfacing for device drivers, buffering, error reporting, allocation/release of dedicated devices, and device-independent block size.

## User-Space I/O Software

Most of the software for the I/O is located within the operating system, but a small chunk consists of libraries linked together by user programs and whole programs running outside of the kernel. System calls are an example of such that are made by a library procedure. Another important point is the spooling system. Spooling involves dealing with dedicated I/O devices in a multiprogramming system. From the textbook, a printer is a typical spooled device.

## Sources

Interrupt Handlers: <https://www.site24x7.com/learn/linux/kernel-hardware-interrupts.html#:~:text=Interrupt%20handlers,-The%20interrupt%20handler&text=The%20ISR%20handles%20the%20request,controlled%20by%20the%20Linux%20kernel>.

Device Drivers: <https://www.spiceworks.com/tech/devops/articles/what-is-device-driver/>