

Understanding Interrupts in Computer Science

An Overview of Interrupts and Their Role in Software

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Lesson Objectives

1. Gain understanding on computer interrupts
2. Define what interrupt is
3. Classify what different types of interrupts and function.

Introduction to Interrupts

Definition of Interrupts

A signal sent to the processor to indicate that an event needs immediate attention.

Purpose of Interrupts

To allow the CPU to respond to important events quickly, improving system efficiency.

Types of Interrupts

Hardware Interrupts

Generated by hardware devices (e.g., keyboard, mouse, disk drives).

Software Interrupts

Generated by programs (e.g., system calls, exceptions).

Hardware Interrupts

Examples of Hardware Interrupts

- Keyboard press, mouse click, disk I/O completion.

How Hardware Interrupts Work

- Device sends an interrupt signal to the CPU.
- CPU stops its current task, saves its state, and executes the interrupt service routine (ISR).

Software Interrupts

Examples of Software Interrupts

- System calls (e.g., requesting file operations).
- Exceptions (e.g., division by zero).

How Software Interrupts Work

- Generated by programs or the operating system to handle special conditions or requests.

Interrupt Service Routine

Definition of ISR

- A special function or routine that handles the interrupt.

Process

- CPU executes ISR, handles the interrupt, and then returns to the interrupted task.

Importance of ISRs

- Ensures that the system can quickly respond to interrupts and resume normal operation.

Concept of Prioritization

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- Some interrupts are more critical than others and need to be handled first.

Types of Prioritization

- Fixed priority (predefined levels of importance).
- Dynamic priority (priority changes based on context).

Interrupt Handling Process

Steps in Interrupt Handling

- Interrupt signal is received.
- CPU halts current execution and saves state.
- ISR is executed.
- CPU restores state and resumes normal operation.

Benefits of using Interrupts

Efficiency

- Allows the CPU to handle multiple tasks effectively.
- Responsiveness
- Enables real-time processing of important events.
- Resource Management
- Improves overall system performance by managing hardware resources effectively.

Example Scenarios

Scenario 1: Keyboard Interrupt

How a key press generates an interrupt and how the CPU processes it.

Scenario 2: Disk I/O Interrupt

How completion of a disk operation triggers an interrupt and the subsequent actions.

Final Thoughts

- Interrupts are crucial for efficient and responsive computing systems.

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