

Operating System Course Report - First Half of the Semester

B class

October 1, 2024

Contents

1 Introduction

This report summarizes the topics covered during the first half of the Operating System course. It includes theoretical concepts, practical implementations, and assignments. The course focuses on the fundamentals of operating systems, including system architecture, process management, CPU scheduling, and deadlock handling.

2 Course Overview

2.1 Objectives

The main objectives of this course are:

- To understand the basic components and architecture of a computer system.
- To learn process management, scheduling, and inter-process communication.
- To explore file systems, input/output management, and virtualization.
- To study the prevention and handling of deadlocks in operating systems.

2.2 Course Structure

The course is divided into two halves. This report focuses on the first half, which covers:

- Basic Concepts and Components of Computer Systems
- System Performance and Metrics
- System Architecture of Computer Systems
- Process Description and Control
- Scheduling Algorithms
- Process Creation and Termination

- Introduction to Threads
- File Systems
- Input and Output Management
- Deadlock Introduction and Prevention
- User Interface Management
- Virtualization in Operating Systems

3 Topics Covered

3.1 Basic Concepts and Components of Computer Systems

This section explains the fundamental components that make up a computer system, including the CPU, memory, storage, and input/output devices.

3.2 System Performance and Metrics

This section introduces various system performance metrics used to measure the efficiency of a computer system, including throughput, response time, and utilization.

3.3 System Architecture of Computer Systems

Describes the architecture of modern computer systems, focusing on the interaction between hardware and the operating system.

3.4 Process Description and Control

Processes are a central concept in operating systems. This section covers:

- Process states and state transitions
- Process control block (PCB)
- Context switching

3.5 Scheduling Algorithms

This section covers:

- First-Come, First-Served (FCFS)
- Shortest Job Next (SJN)
- Round Robin (RR)

It explains how these algorithms are used to allocate CPU time to processes.

3.6 Process Creation and Termination

Details how processes are created and terminated by the operating system, including:

- Process spawning
- Process termination conditions

3.7 Introduction to Threads

This section introduces the concept of threads and their relation to processes, covering:

- Single-threaded vs. multi-threaded processes
- Benefits of multithreading

Seperti yang terlihat pada Gambar ??, inilah cara menambahkan gambar dengan keterangan.

3.8 File Systems

File systems provide a way for the operating system to store, retrieve, and manage data. This section explains:

- File system structure
- File access methods
- Directory management



/Users/khawaritzmi/Unhas/os_report_mid2024/b_class/asset/example.

Figure 1: Ini adalah gambar contoh dari multithreading.

3.9 Input and Output Management

Input and output management is key for handling the interaction between the system and external devices. This section includes:

- Device drivers
- I/O scheduling

3.10 Deadlock Introduction and Prevention

Explores the concept of deadlocks and methods for preventing them:

- Deadlock conditions
- Deadlock prevention techniques

3.11 User Interface Management

3.11.1 Interaksi antara Pengguna dan Sistem Operasi

Interaksi antara pengguna dan sistem operasi adalah proses dinamis yang melibatkan berbagai komponen sistem. Sistem operasi modern berupaya

untuk menyediakan pengalaman yang mulus dan intuitif, sering kali menggabungkan elemen GUI dan CLI untuk memenuhi kebutuhan berbagai jenis pengguna [?].

Aspek-aspek kunci dari interaksi ini meliputi:

- Input/Output Management: Sistem operasi mengelola berbagai perangkat input (keyboard, mouse, touchscreen) dan output (display, audio).
- Process Management: Mengatur eksekusi dan prioritas aplikasi dan layanan yang berjalan.
- File System Interaction: Menyediakan antarmuka untuk mengakses, memodifikasi, dan mengelola file dan direktori.
- Network Communication: Mengelola koneksi jaringan dan menyediakan antarmuka untuk konfigurasi dan monitoring.
- Security and Authentication: Mengimplementasikan mekanisme untuk mengamankan sistem dan memverifikasi identitas pengguna.
- System Configuration: Menyediakan alat untuk menyesuaikan perilaku sistem sesuai preferensi pengguna.

Tren terbaru dalam interaksi pengguna-sistem operasi meliputi:

- Antarmuka Suara dan AI: Integrasi asisten virtual dan kontrol suara untuk interaksi hands-free [?].
- Personalisasi Berbasis AI: Sistem yang mempelajari kebiasaan pengguna dan menyesuaikan antarmuka secara otomatis [?].
- Antarmuka Gesture: Peningkatan dukungan untuk kontrol berbasis gerakan, terutama pada perangkat mobile dan AR/VR.
- Aksesibilitas Lanjutan: Fitur yang lebih canggih untuk mendukung pengguna dengan berbagai kemampuan dan preferensi.
- Integrasi Cross-Platform: Peningkatan sinkronisasi dan konsistensi pengalaman pengguna di berbagai perangkat dan platform.

References

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3.12 Virtualization in Operating Systems

Virtualization allows multiple operating systems to run concurrently on a single physical machine. This section explores:

- Concept of virtualization
- Hypervisors and their types
- Benefits of virtualization in modern computing

4 Assignments and Practical Work

4.1 Assignment 1: Process Scheduling

Students were tasked with implementing various process scheduling algorithms (e.g., FCFS, SJN, and RR) and comparing their performance under different conditions.

4.1.1 Group 1

```
class Process:
def __init__(self, pid, arrival_time, burst_time):
    self.pid = pid
    self.arrival_time = arrival_time
    self.burst_time = burst_time
    self.completion_time = 0
    self.turnaround_time = 0
    self.waiting_time = 0
```

Header 1	Header 2	Header 3
Row 1, Column 1	Row 1, Column 2	Row 1, Column 3
Row 2, Column 1	Row 2, Column 2	Row 2, Column 3

Table 1: Your table caption

4.2 Assignment 2: Deadlock Handling

In this assignment, students were asked to simulate different deadlock scenarios and explore various prevention methods.

4.3 Assignment 3: Multithreading and Amdahl's Law

This assignment involved designing a multithreading scenario to solve a computationally intensive problem. Students then applied **Amdahl's Law** to calculate the theoretical speedup of the program as the number of threads increased.

4.4 Assignment 4: Simple Command-Line Interface (CLI) for User Interface Management

Students were tasked with creating a simple **CLI** for user interface management. The CLI should support basic commands such as file manipulation (creating, listing, and deleting files), process management, and system status reporting.

4.5 Assignment 5: File System Access

In this assignment, students implemented file system access routines, including:

- File creation and deletion
- Reading from and writing to files
- Navigating directories and managing file permissions

5 Conclusion

The first half of the course introduced core operating system concepts, including process management, scheduling, multithreading, and file system access. These topics provided a foundation for more advanced topics to be covered in the second half of the course.