

Operating System Course Report - First Half of the Semester

A class

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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 1, 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/a_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

This section discusses the role of the operating system in managing the user interface. Topics covered include:

- Graphical User Interface (GUI)

- Command-Line Interface (CLI)
- Interaction between the user and the operating system

3.11.1 Karakteristik User Interface

Dalam mendesain antarmuka pengguna, terdapat beberapa karakteristik yang harus dipertimbangkan agar pengguna mendapatkan pengalaman yang optimal. Karakteristik tersebut adalah:

- **Jelas (*Clarity*)**: Antarmuka yang jelas memudahkan pengguna memahami fungsionalitas dan informasi yang disajikan [5].
- **Singkat (*Conciseness*)**: Penyajian informasi yang tidak bertele-tele meningkatkan efektivitas penggunaan antarmuka [9].
- **Konsisten (*Consistency*)**: Konsistensi dalam tampilan dan fungsi antarmuka membantu pengguna menguasai sistem dengan lebih cepat [6].
- **Responsif (*Responsiveness*)**: Responsivitas penting agar pengguna merasa antarmuka dapat diandalkan [3].
- **Menarik (*Attractiveness*)**: Tampilan yang menarik secara visual meningkatkan kepuasan pengguna [11].
- **Familiar (*Familiarity*)**: Menggunakan elemen yang sudah dikenal pengguna mempermudah adaptasi dengan antarmuka [7].
- **Efisien (*Efficiency*)**: Antarmuka harus memfasilitasi tugas pengguna dengan cepat dan mudah [4].

3.11.2 Contoh User Interface

Dalam dunia desain antarmuka pengguna (UI), tren terus berkembang untuk memberikan pengalaman yang lebih interaktif dan menyenangkan. Beberapa contoh tren UI yang sedang populer saat ini meliputi:

Advance Cursor Interactions *Advance cursor interactions* melibatkan penggunaan kursor untuk lebih dari sekadar penunjuk sederhana. UI ini memungkinkan kursor merespons interaksi pengguna dengan efek seperti perubahan bentuk, ukuran, atau warna, memberikan pengalaman yang lebih interaktif dan imersif [1]. Efek ini meningkatkan keterlibatan pengguna dengan membuat elemen UI terasa lebih responsif dan hidup.

Complex & Animated Gradients Gradien kompleks dengan animasi memberikan tampilan yang dinamis pada antarmuka pengguna. Penggunaan berbagai warna dengan perpindahan halus dan animasi lembut menciptakan visual yang menarik dan memberikan kesan modern [10]. Gradien ini sering digunakan untuk memberikan kedalaman dan menciptakan ilusi gerakan di dalam UI.

Bold Color Choices Pemilihan warna yang tegas dan mencolok semakin populer di desain UI. Warna-warna berani memberikan kontras yang kuat dan menciptakan suasana yang energik dan penuh semangat. Desain dengan warna tegas juga dapat menarik perhatian pengguna dan memandu mereka ke bagian penting dari antarmuka [2].

Focus on Typography Fokus pada tipografi dalam UI menekankan pentingnya penggunaan font yang tepat untuk menyampaikan pesan dengan jelas. Ukuran huruf yang besar dan pilihan font yang kuat membantu meningkatkan keterbacaan serta estetika antarmuka [12]. Tipografi yang baik juga memperkuat identitas merek dan meningkatkan pengalaman pengguna secara keseluruhan.

Dark Mode *Dark mode* menjadi tren populer karena mengurangi ketegangan mata saat pengguna menggunakan aplikasi dalam kondisi pencahayaan rendah. Dengan menggunakan warna gelap sebagai latar belakang dan warna terang untuk teks, mode ini juga membantu menghemat energi pada perangkat dengan layar OLED [8]. Selain itu, dark mode memberikan tampilan yang lebih elegan dan modern pada UI.



Figure 2: Contoh desain UI.

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.

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