Report on

“Paging Simulation”

For

Operating System - 2CS506CC23

B. Tech. Semester IV

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Index

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Chapter 1. Objectives

Paging Simulation

Problem Statement

Paging is a **memory management** scheme that eliminates the need for contiguous memory allocation by dividing processes into fixed-size pages and mapping them to frames in physical memory. In operating systems, efficient paging mechanisms help in optimal memory utilization, reducing fragmentation, and improving process execution efficiency.

However, challenges like page faults and inefficient replacement strategies persist. This project simulates paging mechanics.

System Overview :

The Paging Simulation Portal is an interactive web-based tool that:

- Demonstrate the concept of **virtual memory paging** in operating systems.
- Visualizes address translation, page faults, and replacement steps.

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Chapter 2. Functionalities

Core Components:

1. **Configuration Management**
    - **Set frame size (multiples of 1024 bytes).**
    - **Define total virtual pages and physical frames.**
    - **Initialize page-to-frame mappings (e.g., `0:2, 1:1`).**
    - **Real-time validation of inputs and mappings.**
2. **Virtual Memory Table**:
    - Tracks virtual pages and their corresponding frame allocations.
    - Attributes:
        - Virtual Page Number
        - Frame Number (or **'X'** if unallocated).
3. **Physical Memory Table**:
    - Displays frame numbers and their mapped physical addresses.
    - Attributes:
        - Frame Number
        - Physical Address Range.

User Interaction:

1. **Input**: Virtual address (decimal/binary).
2. **Output**:
    - Physical address (if mapped).
    - Page fault notification.
3. **Visualization**:
    - Highlighted memory tables.
    - Step-by-step address translation (binary/decimal).

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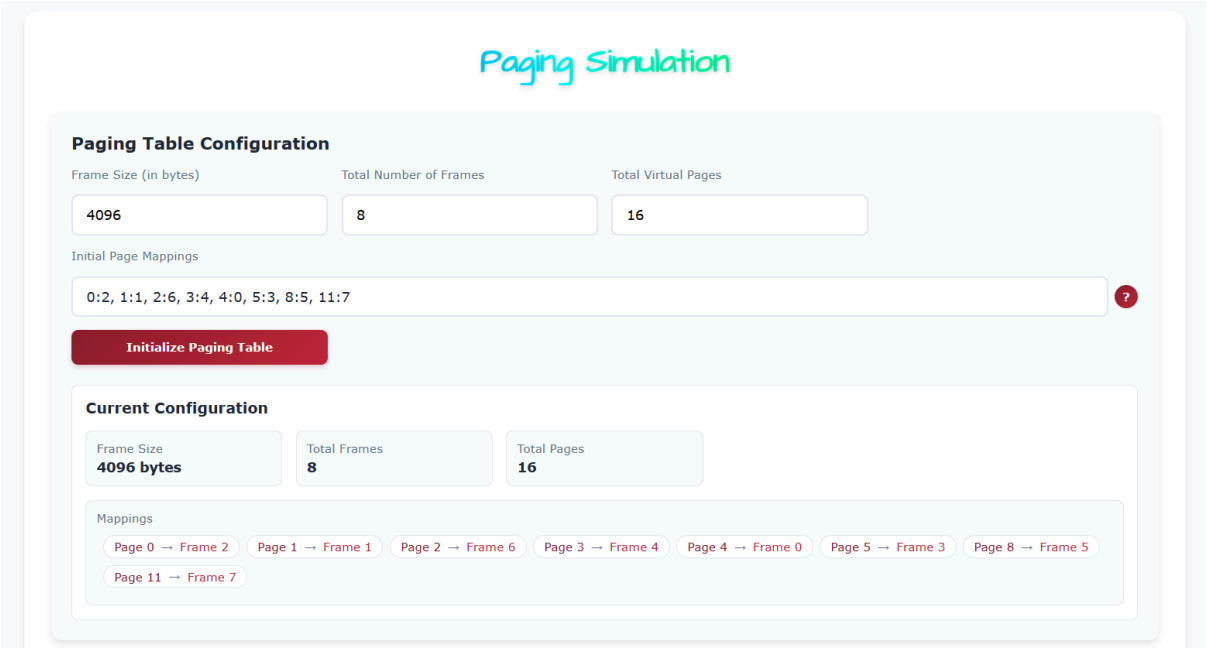
Chapter 3 . Code

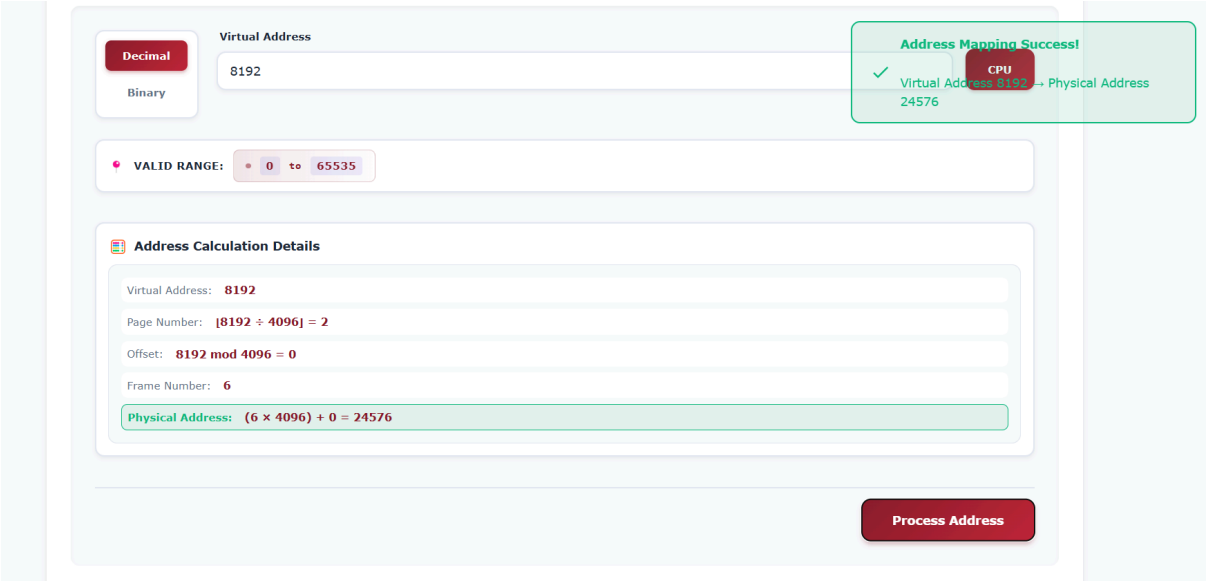
Technologies Used: HTML, CSS, JavaScript.

Key Components

1. **HTML Structure**
    - Configuration panel for frame/page setup.
    - Input section for addresses and format toggles.
    - Tables for virtual/physical memory display.
    - Dynamic sections for calculations.
2. **CSS Styling**
    - Themed UI with gradients and shadows.
    - Responsive grids for tables and memory states.
    - Animations for notifications (e.g., page fault alerts).
3. **JavaScript Logic**
    - `initializePagingTable()`: Validates inputs and initializes the page table.
    - `processAddress()`: Computes page number/offset, checks for page faults.
    - **Dynamic DOM Updates**: Tables, calculations, and visualizations refresh based on user actions.
    - **Event Listeners**: Handle input changes, button clicks, and format toggles.

Chapter 4 . Output





Process Address

Virtual Memory Table

Virtual Page	Frame Number
0-4095	2
4096-8191	1
8192-12287	6
12288-16383	4
16384-20479	0
20480-24575	3
24576-28671	X
28672-32767	X
32768-36863	5
36864-40959	X
40960-45055	X
45056-49151	7
49152-53247	X
53248-57343	X
57344-61439	X
61440-65535	X

Physical Memory

Frame	Address Range
0	0-4095
1	4096-8191
2	8192-12287
3	12288-16383
4	16384-20479
5	20480-24575
6	24576-28671
7	28672-32767

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Chapter 5. Conclusion

The Paging Simulation successfully demonstrates:

1. **Efficient Address Translation**: Seamless conversion of virtual to physical addresses.
2. **User Engagement**: Interactive visualizations for understanding paging.
3. **Paging eliminates external fragmentation** by dividing memory into fixed-size pages and mapping them to frames.