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VIRTUAL MEMORY MANAGEMENT

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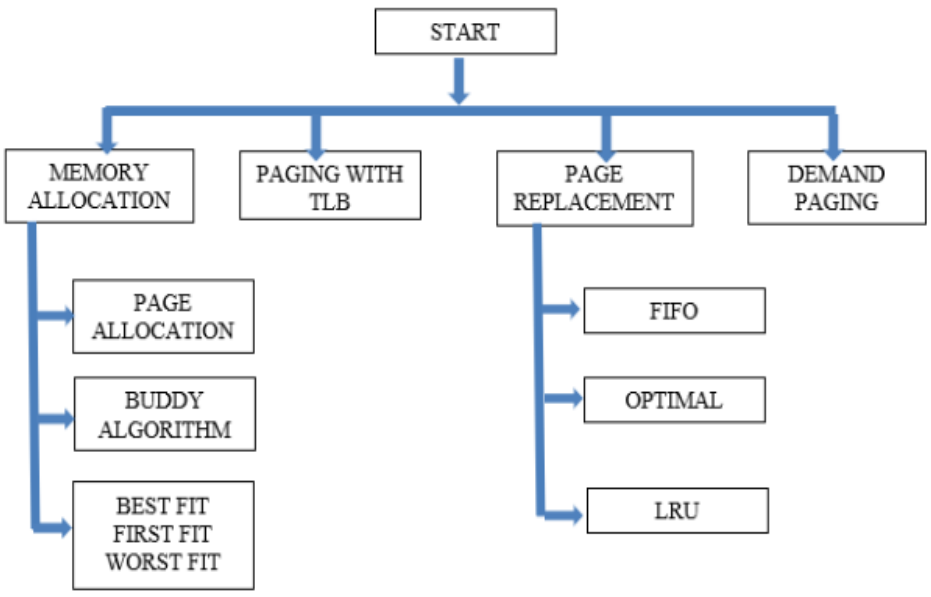
Introduction:

1. Virtual memory management is a core component of modern operating systems.
2. It abstracts physical memory through virtual addressing, providing each process with its own contiguous address space.
3. Dynamic memory allocation techniques like the Buddy algorithm optimize resource utilization and reduce fragmentation.
4. Page allocation and intelligent page replacement algorithms ensure efficient memory management.
5. The Translation Lookaside Buffer (TLB) accelerates address translation, enhancing system performance.
6. This project aims to explore virtual memory management mechanisms and algorithms for improved memory optimization in computing environments.

Methodology:



System Calls Used

Memory Management:

•mmap(): Maps files, devices, or memory segments into the process's address space, facilitating efficient access. Returns a pointer to the mapped memory region.

•munmap(): Removes mappings established by mmap(), deallocating the mapped memory region.

File Management:

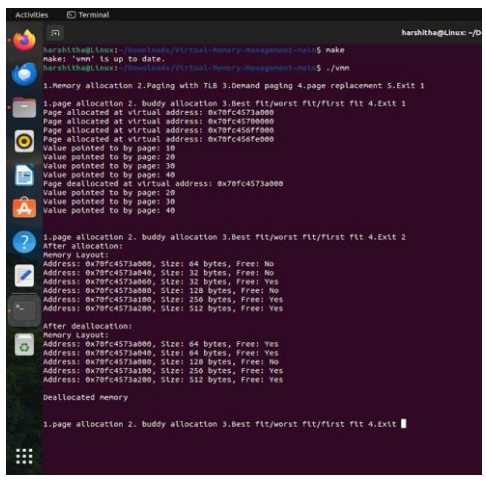
•fopen(): Opens a file, creating a new file descriptor. Returns a pointer to a FILE structure for subsequent file operations.

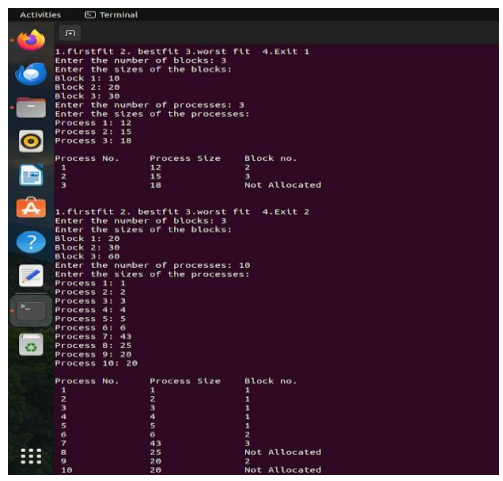
•fclose(): Closes a file opened with fopen(), flushing buffered data and releasing associated resources.

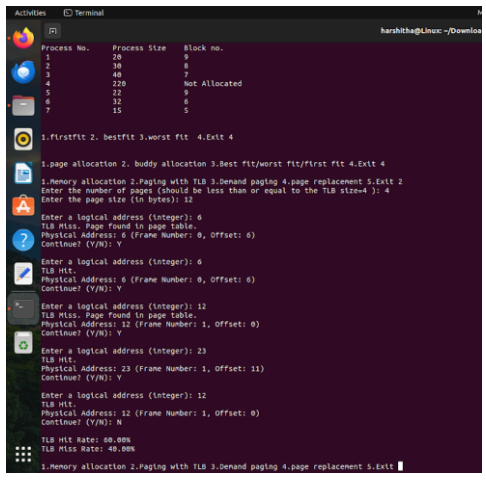
•fseek(): Sets the file position indicator for the specified file stream, allowing movement for the next fread() or fwrite() operation.

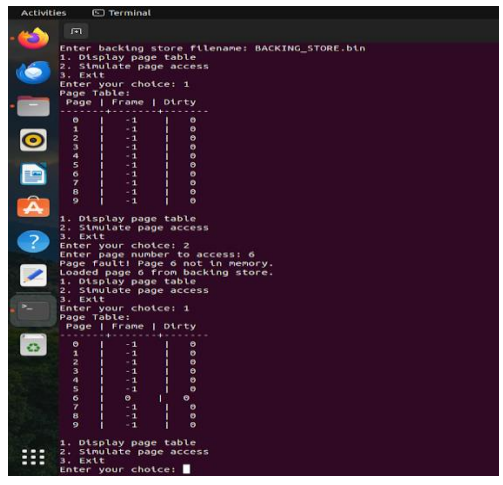
•fread(): Reads data from a file into memory. Takes a buffer pointer, element size, element count, and file stream as arguments, returning the number of elements successfully read.

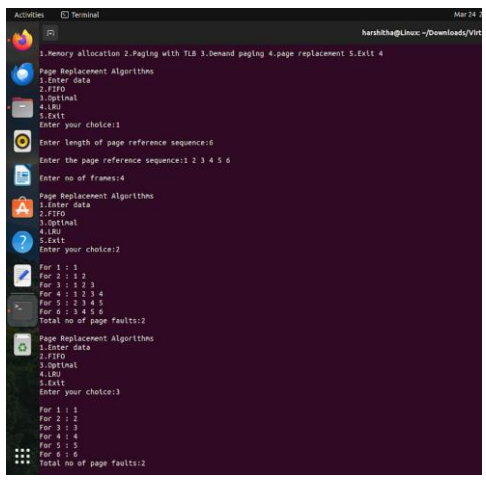
Results:

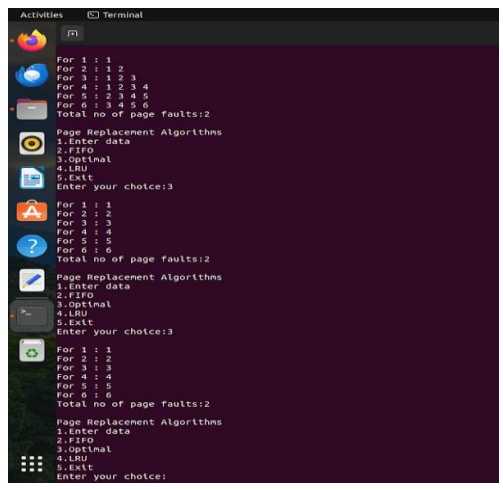












Conclusion:

Our virtual memory management system has successfully integrated memory allocation strategies like the Buddy algorithm, best-fit, worst-fit, and first-fit, optimizing memory usage for enhanced system performance. Additionally, we've incorporated page replacement algorithms such as FIFO, LRU, and Optimal Paging, minimizing overhead and maximizing efficiency by intelligently replacing pages. Demand paging and TLB functionality ensure swift handling of page faults and address translation. Insightful metrics like hit and miss ratios facilitate comprehensive performance analysis. Future work could focus on refining these algorithms for greater efficiency and scalability, meeting the evolving demands of modern computing environments.

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Submitted to

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