



# Vidyavardhini's College of Engineering and Technology

## Department of Artificial Intelligence & Data Science

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Experiment No.9
Memory Management: Virtual Memory a Write a program in C demonstrate the concept of page replacement policies for handling page faults eg: FIFO, LRU, Optimal
Date of Performance:
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**Aim:** Memory Management: Virtual Memory

**Objective:**

To study and implement page replacement policy FIFO, LRU, OPTIMAL

**Theory:**

### **Demand Paging**

A demand paging system is quite similar to a paging system with swapping where processes reside in secondary memory and pages are loaded only on demand, not in advance. When a context switch occurs, the operating system does not copy any of the old program's pages out to the disk or any of the new program's pages into the main memory. Instead, it just begins executing the new program after loading the first page and fetches that program's pages as they are referenced.

### **Page Replacement Algorithm**

Page replacement algorithms are the techniques using which an Operating System decides which memory pages to swap out, write to disk when a page of memory needs to be allocated.

### **Reference String**

The string of memory references is called reference string. Reference strings are generated artificially or by tracing a given system and recording the address of each memory reference.

### **First In First Out (FIFO)**

This is the simplest page replacement algorithm. In this algorithm, the OS maintains a queue that keeps track of all the pages in memory, with the oldest page at the front and the most recent page at the back.

When there is a need for page replacement, the FIFO algorithm, swaps out the page at the front of the queue, that is the page which has been in the memory for the longest time.

### **Least Recently Used (LRU)**

Least Recently Used page replacement algorithm keeps track of page usage over a short period of time. It works on the idea that the pages that have been most heavily used in the past are most likely to be used heavily in the future too.

In LRU, whenever page replacement happens, the page which has not been used for the longest amount of time is replaced.

CSL403: Operating System Lab



### Optimal Page Replacement

Optimal Page Replacement algorithm is the best page replacement algorithm as it gives the least number of page faults. It is also known as OPT, clairvoyant replacement algorithm, or Belady's optimal page replacement policy.

In this algorithm, pages are replaced which would not be used for the longest duration of time in the future, i.e., the pages in the memory which are going to be referred farthest in the future are replaced.

#### Program:

```
// First - Fit algorithm
#include<stdio.h>
void firstFit(int blockSize[], int m, int processSize[], int n)
{
    int i, j;
    int allocation[n];
    for(i = 0; i < n; i++)
    {
        allocation[i] = -1;
    }

    for (i = 0; i < n; i++)
    {
        for (j = 0; j < m; j++)
        {
            if (blockSize[j] >= processSize[i])
            {
                allocation[i] = j;
                blockSize[j] -= processSize[i];

                break;
            }
        }
    }

    printf("\nProcess No.\tProcess Size\tBlock no.\n");
    for (int i = 0; i < n; i++)
    {
        printf(" %i\t\t\t", i+1);
        printf("%i\t\t\t", processSize[i]);
        if (allocation[i] != -1)
            printf("%i", allocation[i] + 1);
        else
            printf("Not Allocated");
        printf("\n");
    }
}
```