

# Lab Three

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October 5, 2021

## 1 PROBLEM ONE

Explain the difference between internal and external fragmentation.

Internal fragmentation can occur when the allocated memory may be larger than requested memory. The size difference is memory internal to the partition but is not used. Therefore, the smaller the block size, the lower the amount of internal fragmentation to be had.

External fragmentation is when the total memory space exists to satisfy a request, but is not contiguous, such that memory must be broken up to fit in the available blocks.

When memory in storage is partitioned into chunks of a pre-determined amount, both internal and external fragmentation can occur. If the chunks are of size 10, then a program of only size 6 will "create" a chunk of size 4. That space is the internal fragmentation. In the same memory space, a program of size 12 cannot fully fit into the open chunk spot of size 10. To fit into memory, the program can external fragment such that it can divide itself up so that it can fit into available spaces in memory. One way would be to divide into 2 sections, of size 10 and 2, where they each can now fit into a free space in memory.

## 2 PROBLEM TWO

Given five (5) memory partitions of 100KB, 500KB, 200KB, 300KB, and 600KB (in that order), how would optimal, first-fit, best-fit, and worst-fit algorithms place processes of 212KB, 417KB, 112KB, and 426KB (in that order)?

### 2.1 FIRST-FIT

- First free partition that 212KB fits into is 500KB
- First free partition that 417KB fits into is 600KB
- First free partition that 112KB fits into is 200KB
- First free partition that 426KB fits into is none

- As a result, it must wait for either the process of size 212KB or 417KB to finish

## 2.2 BEST-FIT

- Best free partition that 212KB fits into is 300KB
- Best free partition that 417KB fits into is 500KB
- Best free partition that 112KB fits into is 200KB
- Best free partition that 426KB fits into is 600KB

## 2.3 WORST-FIT

- Worst fitting free partition that 212KB fits into is 600KB
- Worst fitting free partition that 417KB fits into is 500KB
- Worst fitting free partition that 112KB fits into is 388KB
  - The 388KB partition is a result of the leftover space created by the 212KB process in the 600KB partition
- Worst fitting free partition that 426KB fits into is none
  - As a result, it must wait for either the process of size 417KB or both the 212KB and 112KB processes to finish

## 2.4 OPTIMAL

Given the exact situation outlined above, the optimal solution is the best-fit algorithm. This is mainly due to the fact that all four processes can be given a space in memory initially and do not have to wait for programs to finish before they can be admitted.