Introduction to Memory Management Strategies

Computer science students must grasp memory management as it affects system performance and resource usage. It involves memory allocation and deallocation in an effective way.

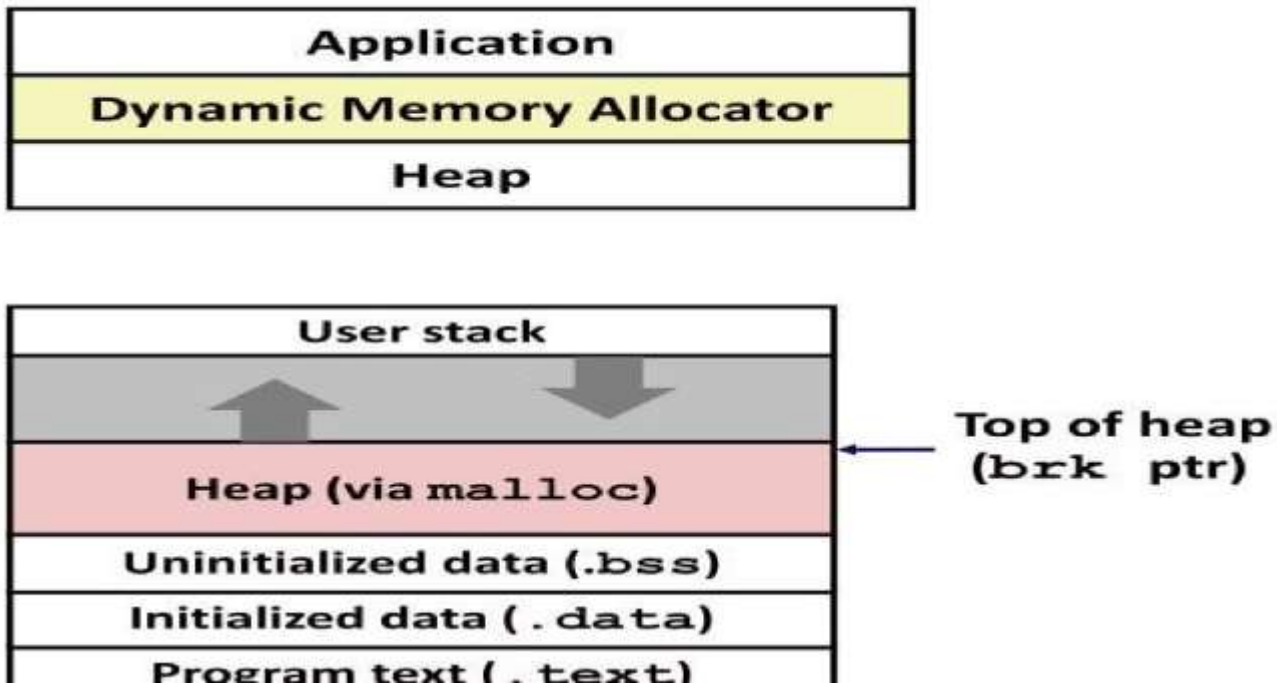
BY:
Leela Prasad(192210150)

T. Lokesh(192224105)

Dhanasekar (192210660)

Dynamic Memory Allocation

- Programmers use *dynamic memory allocators* (such as `malloc`) to acquire VM at run time.
  - For data structures whose size is only known at runtime.
- Dynamic memory allocators manage an area of process virtual memory known as the *heap*.



Overview of Best Fit, First Fit, and Worst Fit Strategies

1

Best Fit Strategy

Finds the smallest available partition that fits the process. Minimizes wastage but may result in fragmentation.

2

First Fit Strategy

Allocates the first available partition large enough to accommodate a process. Simple but can lead to external fragmentation.

3

Worst Fit Strategy

Allocates the largest available partition to a segment, leading to more wasted memory. Reduces the number of remaining holes but can cause slower performance.

Explanation of Best Fit Strategy

1 **Efficiency**

Finds the smallest block that fits, minimizing internal fragmentation.

2 **Complexity**

More complex search algorithm, leading to slower allocation times.

3 **Memory Utilization**

Enhances overall memory utilization, reducing wastage.

4

Keele University

BEST FIT

- The best fit approach emphasizes that HR strategies should be congruent with the context and circumstances of the organization
- Best fit involves vertical integration or alignment between the organization's business and HR strategies
- There are three models: lifecycle, competitive strategy, and strategic configuration

Often said that 'best fit is better than best practice' but best fit models can be unrealistic

StudyGroup

Explanation of First Fit Strategy

1

Simple Allocation

Allocates based on the first block that fits the process size.

2

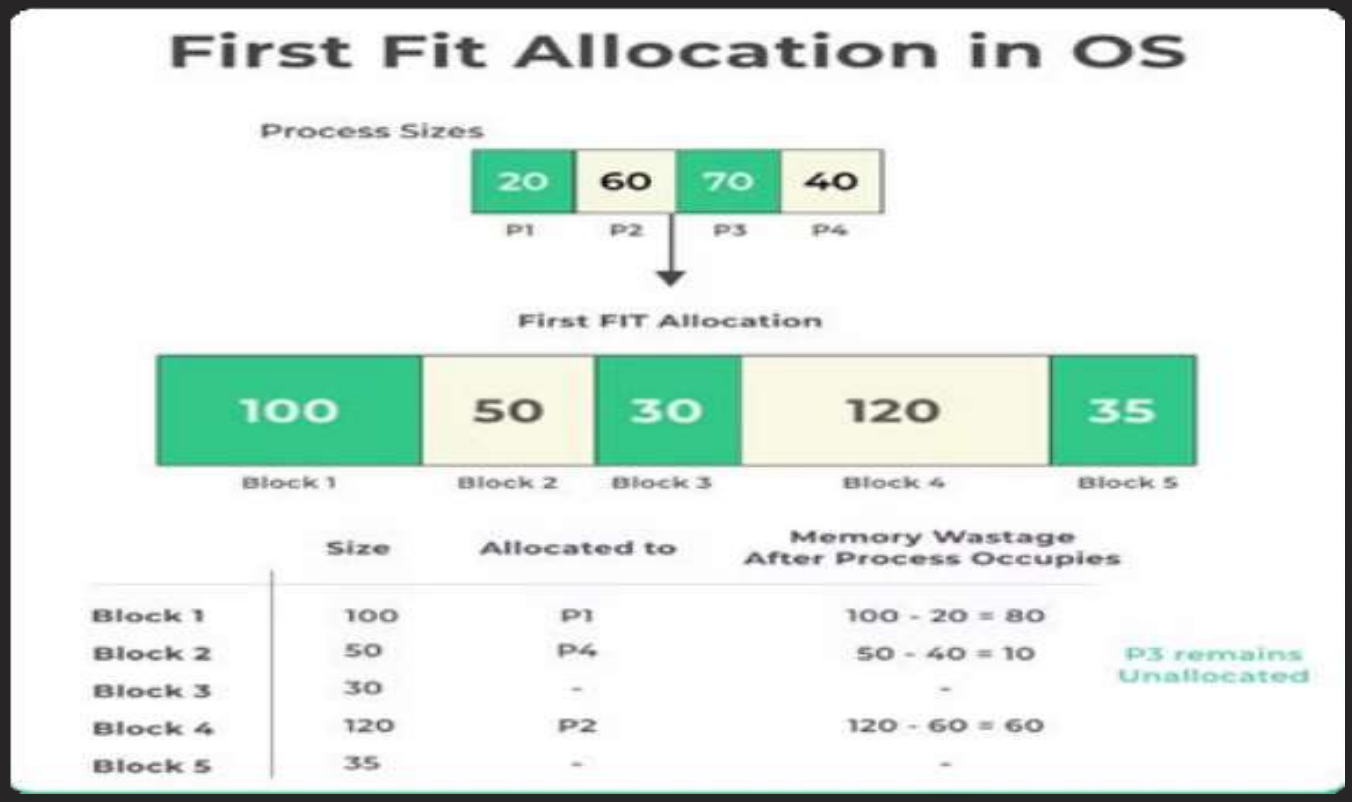
Fragmentation Risk

Tends to create external fragmentation due to variable block sizes.

3

Memory Utilization

May lead to lower overall memory utilization.



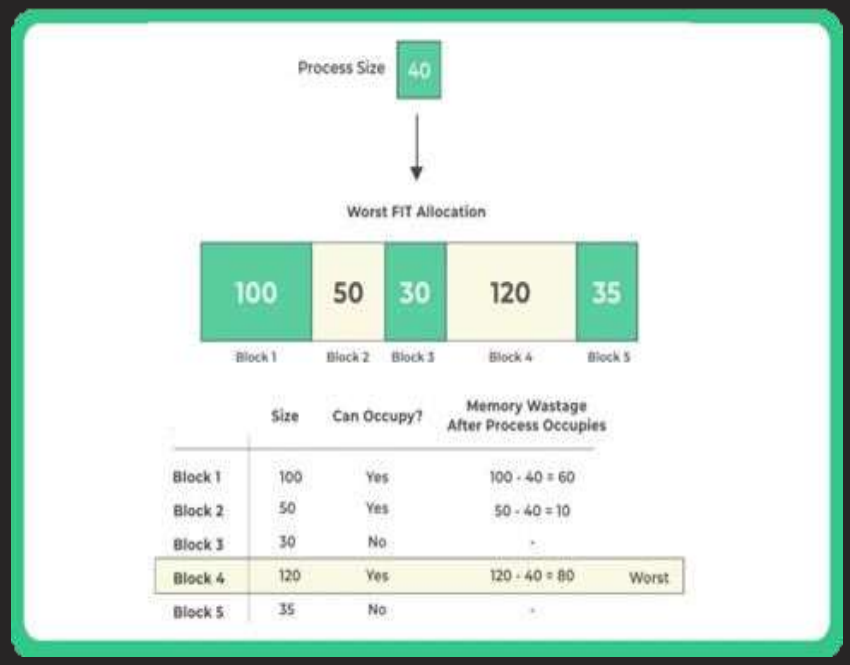
Explanation of Worst Fit Strategy

Memory Wastage

Allocates the largest available partition, often leading to wasted memory.

Performance Impact

Slower performance may be experienced due to increased wastage.



Comparison of Best, First and Worst- Fit Strategies

Best Fit

Minimizes wastage, but potential for internal fragmentation.

First Fit

Simple allocation, but risk of external fragmentation.

Worst Fit

Higher wastage, potential for slower performance.

Result

The project "Memory Master" comprehensively analyzed memory allocation strategies—First Fit, Best Fit, and Worst Fit—under various conditions. Through practical implementation and experimentation, we evaluated their performance based on metrics such as fragmentation, overhead, and throughput. Results showed that while First Fit offers quick allocation with less computational work, it poses a risk of memory fragmentation. Best Fit minimizes memory waste but incurs higher computational overhead, whereas Worst Fit ensures sufficient memory for larger processes but may lead to significant memory waste.

Conclusion

Optimization

Choosing the right strategy is crucial for efficient memory management.

Trade-offs

Each strategy has its advantages and trade-offs, impacting system performance differently.

Future Research

Continued research is essential to develop more effective memory management strategies.