

OPERATING SYSTEM

Contiguous Memory Allocation Algorithms

These algorithms are used in **variable partitioning** to decide **which free memory block (hole)** should be allocated to a process.

1. First Fit

Definition

First Fit allocates the **first free memory block** that is **large enough** to satisfy the process request.

How it Works

- Memory is searched from the **beginning**
- Allocation stops as soon as a suitable hole is found

Advantages

- Fast and simple
- Less searching time

Disadvantages

- External fragmentation
- Small holes may be left at the beginning

Example

Free memory blocks:

100 KB | 500 KB | 200 KB | 300 KB | 600 KB

Process request: 212 KB

- First block large enough = **500 KB**
- Allocate 212 KB from 500 KB

2. Best Fit

Definition

Best Fit allocates the **smallest free block** that is **large enough** for the process.

How it Works

- Entire memory list is searched
- Chooses the closest-sized block

Advantages

- Minimizes memory wastage

Disadvantages

- Slow (searches all blocks)
- Creates many small unusable holes

Example

Free memory blocks:

100 KB | 500 KB | 200 KB | 300 KB | 600 KB

Process request: **212 KB**

- Best block = **300 KB**
- Allocate 212 KB from 300 KB

3. Worst Fit

Definition

Worst Fit allocates the **largest available memory block** to the process.

How it Works

- Searches all free blocks
- Chooses the largest hole

Advantages

- Leaves large remaining holes

Disadvantages

- Poor memory utilization
- May waste large blocks unnecessarily

Example

Free memory blocks:

100 KB | 500 KB | 200 KB | 300 KB | 600 KB

Process request: **212 KB**

- Largest block = **600 KB**
- Allocate 212 KB from 600 KB

4. Next Fit

Definition

Next Fit is similar to First Fit, but instead of starting from the beginning, it continues searching from where the last allocation ended.

How it Works

- Remembers last allocated position
- Searches forward until a suitable block is found

Advantages

- Faster than First Fit in some cases
- Reduces repeated scanning of memory start

Disadvantages

- Still causes external fragmentation
- Not optimal memory utilization

Example

Free memory blocks:

100 KB | 500 KB | 200 KB | 300 KB | 600 KB

Assume last allocation ended at **200 KB block**

Process request: **212 KB**

- Search starts after 200 KB
- Next suitable block = **300 KB**