

3.2 Variable Partitioning

- There are three algorithms for searching the list of free blocks for a specific amount of memory.
 - First Fit
 - Best Fit
 - Worst Fit

first fit

- First Fit : Allocate the first free block that is large enough for the new process.
- This is a fast algorithm.

first fit

Initial memory
mapping

OS
P1 12 KB
<FREE> 10 KB
P2 20 KB
<FREE> 16 KB
P3 6 KB
<FREE> 4 KB

first fit

P4 of 3KB
arrives

OS
P1 12 KB
<FREE> 10 KB
P2 20 KB
<FREE> 16 KB
P3 6 KB
<FREE> 4 KB

first fit

P4 of 3KB
loaded here by
FIRST FIT

OS
P1 12 KB
P4 3 KB
<FREE> 7 KB
P2 20 KB
<FREE> 16 KB
P3 6 KB
<FREE> 4 KB

first fit

P5 of 15KB
arrives

OS
P1 12 KB
P4 3 KB
<FREE> 7 KB
P2 20 KB
<FREE> 16 KB
P3 6 KB
<FREE> 4 KB

first fit

P5 of 15 KB
loaded here by
FIRST FIT

OS
P1 12 KB
P4 3 KB
<FREE> 7 KB
P2 20 KB
P5 15 KB
<FREE> 1 KB
P3 6 KB
<FREE> 4 KB

Best fit

- Best Fit : Allocate the smallest block among those that are large enough for the new process.
- In this method, the OS has to search the entire list, or it can keep it sorted and stop when it hits an entry which has a size larger than the size of new process.
- This algorithm produces the smallest left over block.
- However, it requires more time for searching all the list or sorting it
- If sorting is used, merging the area released when a process terminates to neighboring free blocks, becomes complicated.

best fit

Initial memory
mapping

OS
P1 12 KB
<FREE> 10 KB
P2 20 KB
<FREE> 16 KB
P3 6 KB
<FREE> 4 KB

best fit

P4 of 3KB
arrives

OS
P1 12 KB
<FREE> 10 KB
P2 20 KB
<FREE> 16 KB
P3 6 KB
<FREE> 4 KB

best fit

P4 of 3KB
loaded here by
BEST FIT

OS
P1 12 KB
<FREE> 10 KB
P2 20 KB
<FREE> 16 KB
P3 6 KB
P4 3 KB
<FREE> 1 KB

best fit

P5 of 15KB
arrives

OS
P1 12 KB
<FREE> 10 KB
P2 20 KB
<FREE> 16 KB
P3 6 KB
P4 3 KB
<FREE> 1 KB

best fit

P5 of 15 KB
loaded here by
BEST FIT

OS
P1 12 KB
<FREE> 10 KB
P2 20 KB
P5 15 KB
<FREE> 1 KB
P3 6 KB
P4 3 KB
<FREE> 1 KB

worst fit

- Worst Fit : Allocate the largest block among those that are large enough for the new process.
- Again a search of the entire list or sorting it is needed.
- This algorithm produces the largest over block.

worst fit

Initial memory
mapping

OS
P1 12 KB
<FREE> 10 KB
P2 20 KB
<FREE> 16 KB
P3 6 KB
<FREE> 4 KB

worst fit

P4 of 3KB
arrives

OS
P1 12 KB
<FREE> 10 KB
P2 20 KB
<FREE> 16 KB
P3 6 KB
<FREE> 4 KB

worst fit

P4 of 3KB
Loaded here
by
WORST FIT

OS
P1 12 KB
<FREE> 10 KB
P2 20 KB
P4 3 KB
<FREE> 13 KB
P3 6 KB
<FREE> 4 KB

worst fit

No place to
load P5 of 15K

OS
P1 12 KB
<FREE> 10 KB
P2 20 KB
P4 3 KB
<FREE> 13 KB
P3 6 KB
<FREE> 4 KB

worst fit

No place to
load P5 of 15K

OS
P1 12 KB
<FREE> 10 KB
P2 20 KB
P4 3 KB
<FREE> 13 KB
P3 6 KB
<FREE> 4 KB

- Given five memory partitions of 100Kb, 500Kb, 200Kb, 300Kb, 600Kb (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of 212 Kb, 417 Kb, 112 Kb, and 426 Kb (in order)? Which algorithm makes the most efficient use of memory?

- 1. Given five memory partitions of 100Kb, 500Kb, 200Kb, 300Kb, 600Kb (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of 212 Kb, 417 Kb, 112 Kb, and 426 Kb (in order)? Which algorithm makes the most efficient use of memory?

- First-fit:

212K is put in 500K partition
417K is put in 600K partition
112K is put in 288K partition (new partition $288K = 500K - 212K$)
426K must wait

- Best-fit:

212K is put in 300K partition
417K is put in 500K partition
112K is put in 200K partition
426K is put in 600K partition

- Worst-fit:

212K is put in 600K partition
417K is put in 500K partition
112K is put in 388K partition
426K must wait

- In this example, best-fit turns out to be the best.

212,417,112,426

100	500	200	300	600		