

Unit-4: Contiguous Memory Allocation

Q. Given 6 memory partitions of 300 KB, 600 KB, 350 KB, 200 KB, 750 KB and 125 KB (in order). How would the ~~first-bit~~ first-fit, best-fit and worst-fit algorithms place processes of size 115 KB, 500 KB, 358 KB, 200 KB, and 375 KB (in order)? Rank the algorithms in terms of how efficiently they use memory.

First-fit:

115 KB process is put in 300 KB partition,

leaving (185 KB, 600 KB, 350 KB, 200 KB, 750 KB, 125 KB).

500 KB process is put in 600 KB partition,

leaving (185 KB, 100 KB, 350 KB, 200 KB, 750 KB, 125 KB).

358 KB process is put in 750 KB partition,

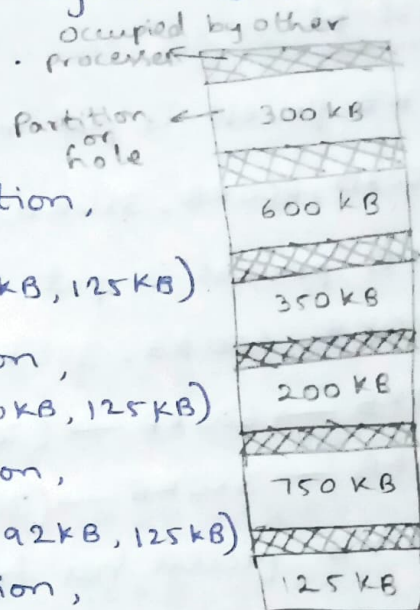
leaving (185 KB, 100 KB, 350 KB, 200 KB, 392 KB, 125 KB).

200 KB process is put in 350 KB partition,

leaving (185 KB, 100 KB, 150 KB, 200 KB, 392 KB, 125 KB).

375 KB process is put in 392 KB partition, leaving

(185 KB, 100 KB, 150 KB, 200 KB, 17 KB, 125 KB).



Best-fit:

115 KB process is put in 125 KB partition, leaving

(300 KB, 600 KB, 350 KB, 200 KB, 750 KB, 10 KB).

500 KB → 600 KB → (300 KB, 100 KB, 350 KB, 200 KB, 750 KB, 10 KB)

358 KB → 750 KB → (300 KB, 100 KB, 350 KB, 200 KB, 392 KB, 10 KB)

200 KB → 200 KB → (300 KB, 100 KB, 350 KB, 0 KB, 392 KB, 10 KB)

375 KB → 392 KB → (300 KB, 100 KB, 350 KB, 0 KB, 17 KB, 10 KB)

First-fit algorithm: In first-fit algorithm, the first available memory is allocated to the process. i.e. allocate the first hole i.e. big enough.

Best-fit algorithm: In best-fit algorithm, the memory in which the least amount of size will be wasted or leftover will be allocated. Allocate smallest hole that is big enough.

Worst-fit algorithm: In worst-fit algorithm, the ~~largest~~ largest memory will be allocated. i.e. allocate the largest hole

Worst-fit:

115 KB process is put in 750KB partition, leaving
(300KB, 600KB, 350KB, 200KB, 635KB, 125KB)

500 KB process is put in 635 KB partition, leaving
(300KB, 600KB, 350KB, 200KB, 135KB, 125KB)

358 KB \rightarrow 600 KB \rightarrow (300KB, 242KB, 350KB, 200KB, 135KB, 125KB)

200 KB \rightarrow 350 KB \rightarrow (300KB, 242KB, 150KB, 200KB, 135KB, 125KB)

375 KB process has to wait as space is not available.

Q. Given 5 memory partitions of 100 KB, 500 KB, 200 KB, 300 KB and 600 KB (in-order). How would each of first-fit, best-fit and worst-fit algorithm places processes of 212 KB, 417 KB, 112 KB, 426 KB (in-order)?

Sol: First-fit: (100KB, 500KB, 200KB, 300KB, 600KB)

212 KB \rightarrow 500 KB \rightarrow (100KB, 288KB, 200KB, 300KB, 600KB)

417 KB \rightarrow 600 KB \rightarrow (100KB, 288KB, 200KB, 300KB, 183KB)

112 KB \rightarrow 288 KB \rightarrow (100KB, 176KB, 200KB, 300KB, 183KB)

426 KB process has to wait as space is not available

Best-fit:

212 KB \rightarrow 300 KB \rightarrow (100KB, 500KB, 200KB, 88KB, 600KB)

417 KB \rightarrow 500 KB \rightarrow (100KB, 83KB, 200KB, 88KB, 600KB)

112 KB \rightarrow 200 KB \rightarrow (100KB, 83KB, 88KB, 88KB, 600KB)

426 KB \rightarrow 600 KB \rightarrow (100KB, 83KB, 88KB, 88KB, 174KB)

Worst-fit:

212 KB \rightarrow 600 KB \rightarrow (100 KB, 500 KB, 200 KB, 300 KB, 388 KB)

417 KB \rightarrow 500 KB \rightarrow (100 KB, 83 KB, 200 KB, 300 KB, 388 KB)

112 KB \rightarrow ~~258~~³⁸⁸ KB \rightarrow (100 KB, 83 KB, 200 KB, 300 KB, 276 KB)

426 KB process has to wait as space is not available.

Q. Given 5 memory partitions of 10 KB, 5 KB, 30 KB, 25 KB, 40 KB (in order). How would first-fit, best-fit and worst-fit algorithms place processes of size 20 KB, 15 KB, 30 KB, 5 KB (in order)?

Sol: 10 KB, 5 KB, 30 KB, 25 KB, 40 KB.

First-fit:

20 KB \rightarrow 30 KB \rightarrow (10 KB, 5 KB, 10 KB, 25 KB, 40 KB)

15 KB \rightarrow 25 KB \rightarrow (10 KB, 5 KB, 10 KB, 10 KB, 40 KB)

30 KB \rightarrow 40 KB \rightarrow (10 KB, 5 KB, 10 KB, 10 KB, 10 KB)

5 KB \rightarrow 10 KB \rightarrow (5 KB, 5 KB, 10 KB, 10 KB, 10 KB)

Best-fit: 5, 10, 25, 30, 40

20 KB \rightarrow 25 KB \rightarrow (10 KB, 5 KB, 30 KB, 5 KB, 40 KB)

15 KB \rightarrow 30 KB \rightarrow (10 KB, 5 KB, 15 KB, 5 KB, 40 KB)

30 KB \rightarrow 40 KB \rightarrow (10 KB, 5 KB, 15 KB, 5 KB, 10 KB)

5 KB \rightarrow 5 KB \rightarrow (10 KB, 0 KB, 15 KB, 5 KB, 10 KB).

Worst-fit: 40, 30, 25, 10, 5

20 KB \rightarrow 40 KB \rightarrow (10 KB, 5 KB, 30 KB, 25 KB, 20 KB)

15 KB \rightarrow 30 KB \rightarrow (10 KB, 5 KB, 15 KB, 25 KB, 20 KB)

30 KB process has to wait as space is not available.

5 KB \rightarrow 25 KB \rightarrow (10 KB, 5 KB, 15 KB, 20 KB, 20 KB).