Test scenario 1:

Purpose:

Demonstrate the behavior of the four algorithms.

Assumption:

max_mem_size = 100, mem_start_address = 0

***Test Case*:**

1. set up memory environment by following requests:
   alloc 1 8 -> alloc 2 15 -> alloc 3 5 -> alloc 4 10 -> alloc 5 11 -> free 2
   -> free 4 -> alloc 6 20 -> alloc 7 18 -> free 6
2. submit request: alloc 8 8

Test Result:

Step 1 results following memory blocks:

Now there are four free blocks as follows, and last memory allocation occurs at 69.

block #	start address	size
1	8	15
2	28	10
3	49	20
4	87	13

Result of step 2:

First-fit: choose block 1. (search from 0, the first block larger than 8)

Next-fit: choose block 4. (search from 69, the first block larger than 8)

Best-fit: choose block 2. (the smallest block larger than 8)

Worst-fit: choose block 3. (the largest block larger than 8)

Conclusion

- Best-fit: Choose the smallest free block of sufficient size.
- Worst-fit: Choose the largest free block of sufficient size.

- First-fit: Search from the beginning, choose the first free block of sufficient size.
- Next-fit: Search from where the last allocation occurs, choose the first free block of sufficient size.

Test scenario 2:

Purpose:

Compare the fragmentation resulted from best-fit and worst-fit.

Assumption:

max_mem_size = 100, mem_start_address = 0

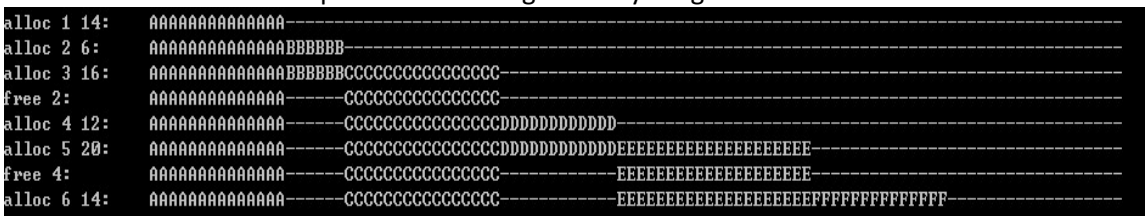
***Test Case*:**

1. Set up memory environment by following requests:
   alloc 1 14 -> alloc 2 6 -> alloc 3 16 -> free 2 -> alloc 4 12
   -> alloc 5 20 -> free 4 -> alloc 6 14
2. Submit requests:
   alloc 7 3 -> alloc 8 8 -> alloc 9 5 -> alloc 10 6 -> alloc 11 5

Test Result:

Result of step 1:

Both best-fit and worst-fit produce following memory usage.

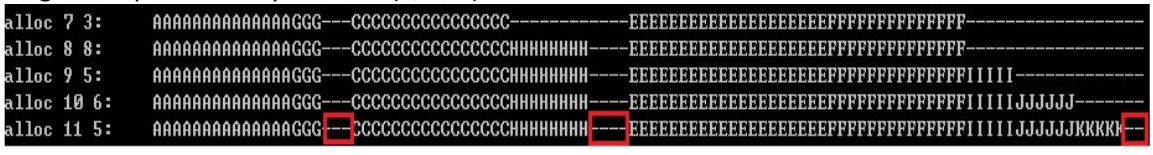


Now there are three free blocks as follows.

block #	start address	size
1	14	6
2	36	12
3	82	18

Result of step 2:

Fragments produced by best-fit: (3, 4, 2)



Fragments produced by worst-fit: (6, 1, 2)

Conclusion

- Best-fit: All remaining holes are too small to be useful.
- Worst-fit: Compared to best fit, increases the possibility that the remaining space can be used by another process.

Test scenario 3:

Purpose:

Compare first-fit with next-fit.

Assumption:

max_mem_size = 100, mem_start_address = 0

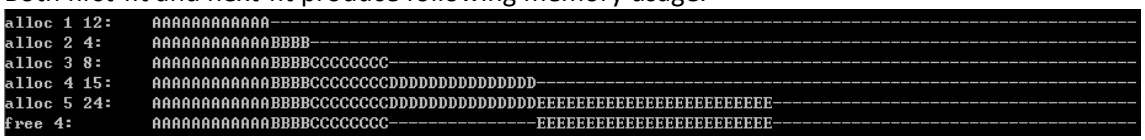
***Test Case*:**

1. Set up memory environment by following requests:
   alloc 1 12 -> alloc 2 4 -> alloc 3 8 -> alloc 4 15 -> alloc 5 24 -> free 4
2. Submit requests:
   alloc 6 10 -> alloc 7 11 -> free 1 -> alloc 8 6 -> alloc 9 4 -> free 2 -> alloc 10 3

Test Result:

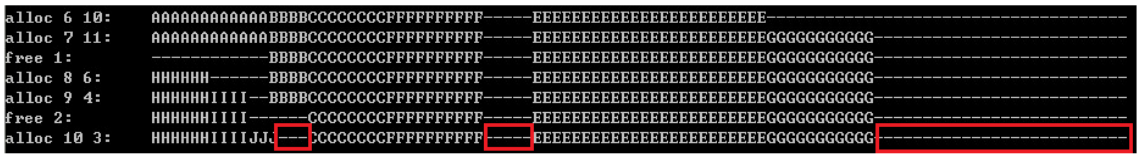
Result of step 1:

Both first-fit and next-fit produce following memory usage.



Result of step 2:

Memory holes produced by first-fit:



Memory holes produced by next-fit:

Conclusion:

- First-fit: Tends to fragment the low memory area, leaving larger free block(s) in the end of the memory.
- Next-fit: Compared to first-fit, tends to chew up the end of the memory.