CST 334: Operating Systems

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# OSTEP Chapter 17: Free Space Management

**Purpose**. This assignment will help you understand how the simple memory allocator of OSTEP Chapter 17 works.

**Instructions**. Read OSTEP chapter 17 and answer the following questions by downloading and editing [chap17.txt](https://drive.google.com/file/d/1wb0MOrTFun8CDRMM11R5NpapxOjuBkEq/view?usp=sharing).

Similarly to the malloc.py simulator at the end of Chapter 17, the following shows a sequence of alloc and free calls, and the state of the free list after each call. The allocator initially has a chunk of memory with base address 1000, of length 100.

(1000,100)

ptr0 = alloc(9)

(1009,91)

free(ptr0)

(1000, 9) -> (1009, 91)

ptr1 = alloc(4)

(1004, 5) -> (1009, 91)

Problems 1-5. Continuing execution, write the state of the free list at the spots indicated with question marks below. **Note carefully**: the allocator is using the **“best-fit” policy**, and when memory is freed it is being put at the front of the free list. No coalescing is being performed.

free(ptr1)

(1000,4) -> (1004, 5) -> (1009, 91)

ptr2 = alloc(3)

(1003,1) -> (1004, 5) -> (1009, 91)

free(ptr2)

(1000, 3) -> (1003, 1) -> (1004, 5) -> (1009, 91)

ptr3 = alloc(10)

(1000, 1) -> (1003, 1) -> (1004, 5) -> (1019, 81)

ptr4 = alloc(8)

(1000, 1) -> (1003, 1) -> (1004, 5) -> (1027, 73)

Do the same as above, but this time using a **“worst-fit” policy**, when memory is freed it is put into the free list so that the free list remains sorted by address value, and coalescing is performed after every free() operation.

(1000,100)

ptr0 = alloc(2)

(1002,98)

ptr1 = alloc(26)

(1028,72)

free(ptr0)

(1000,2) -> (1028,72)

Problems 6-10. Continuing execution, write the state of the free list where the question marks appear:

ptr2 = alloc(24)

(1000,2) -> (1052,48)

ptr3 = alloc(30)

(1000,2) -> (1082,18)

free(ptr1)

(1000,2) -> (1002,26) -> (1082,18)

ptr4 = alloc(13)

(1000,2) -> (1015,13) -> (1082,18)

ptr5 = alloc(13)

(1000,2) -> (1015,13) -> (1095,5)

**Submission**: Submit your edited version of chap17.txt on iLearn.

**Grading**: Each question is worth 10 points.