Test Log For MP4

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TEST Plan:(See MP4 lab4.c)

1.Do the Unit test 0 and 1 in default (Head_First) and (Rover_First) Method
and using -f best, first, and worst to test the basic correctness of every Search method.(They are supposed to be same in everything, the first Heap Memory Statistics is supposed to be in use!)

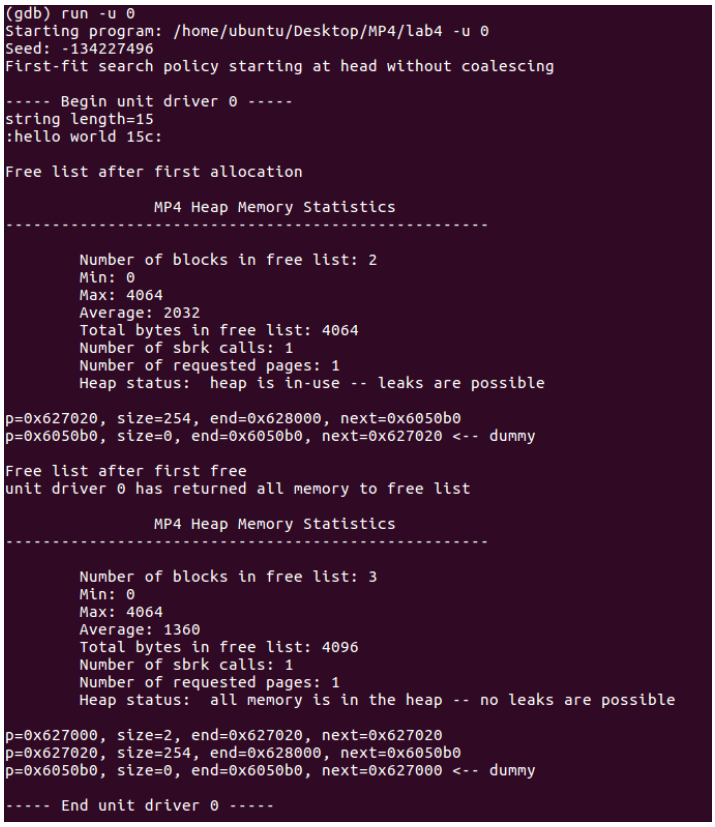
(1)best head unit0.PNG

```
(gdb) run -f best -h head -u 0
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f best -h head -u 0
Seed: -134227496
Best-fit search policy starting at head without coalescing

----- Begin unit driver 0 -----
string length=15
:hello world 15c:

Free list after first allocation

               MP4 Heap Memory Statistics
-------------------------------------------------

        Number of blocks in free list: 2
        Min: 0
        Max: 4064
        Average: 2032
        Total bytes in free list: 4064
        Number of sbrk calls: 1
        Number of requested pages: 1
        Heap status:  heap is in-use -- leaks are possible

p=0x627020, size=254, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627020 <-- dummy

Free list after first free
unit driver 0 has returned all memory to free list

               MP4 Heap Memory Statistics
-------------------------------------------------

        Number of blocks in free list: 3
        Min: 0
        Max: 4064
        Average: 1360
        Total bytes in free list: 4096
        Number of sbrk calls: 1
        Number of requested pages: 1
        Heap status:  all memory is in the heap -- no leaks are possible

p=0x627000, size=2, end=0x627020, next=0x627020
p=0x627020, size=254, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627000 <-- dummy

----- End unit driver 0 -----
```

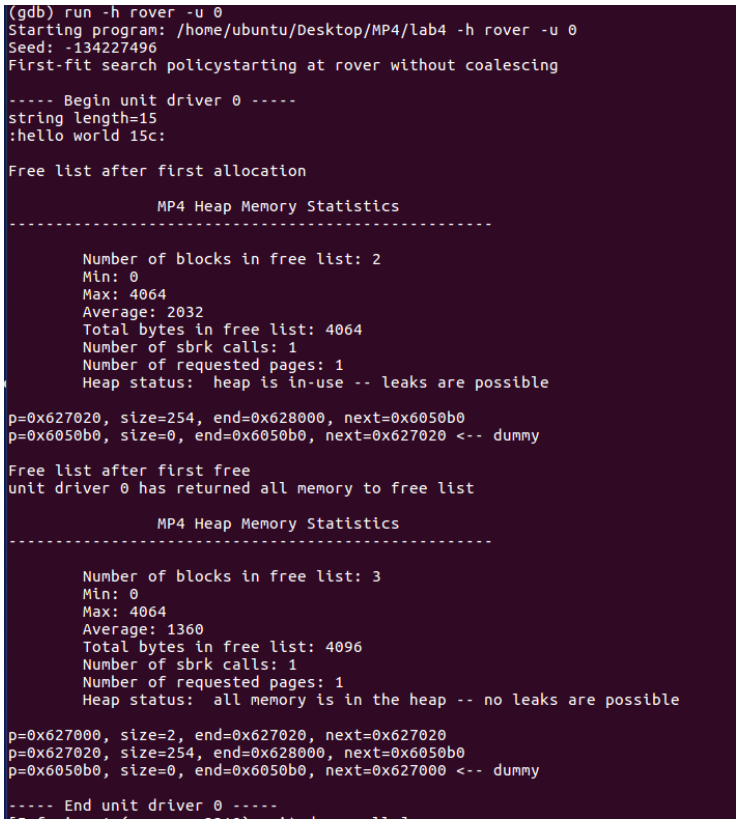
(2) best rover unit0.PNG

```
(gdb) run -f best -h rover -u 0
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f best -h rover -u 0
Seed: -134227496
Best-fit search policystarting at rover without coalescing

----- Begin unit driver 0 -----
string length=15
:hello world 15c:

Free list after first allocation

               MP4 Heap Memory Statistics
-------------------------------------------------

        Number of blocks in free list: 2
        Min: 0
        Max: 4064
        Average: 2032
        Total bytes in free list: 4064
        Number of sbrk calls: 1
        Number of requested pages: 1
        Heap status:  heap is in-use -- leaks are possible

p=0x627020, size=254, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627020 <-- dummy

Free list after first free
unit driver 0 has returned all memory to free list

               MP4 Heap Memory Statistics
-------------------------------------------------

        Number of blocks in free list: 3
        Min: 0
        Max: 4064
        Average: 1360
        Total bytes in free list: 4096
        Number of sbrk calls: 1
        Number of requested pages: 1
        Heap status:  all memory is in the heap -- no leaks are possible

p=0x627000, size=2, end=0x627020, next=0x627020
p=0x627020, size=254, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627000 <-- dummy

----- End unit driver 0 -----
```

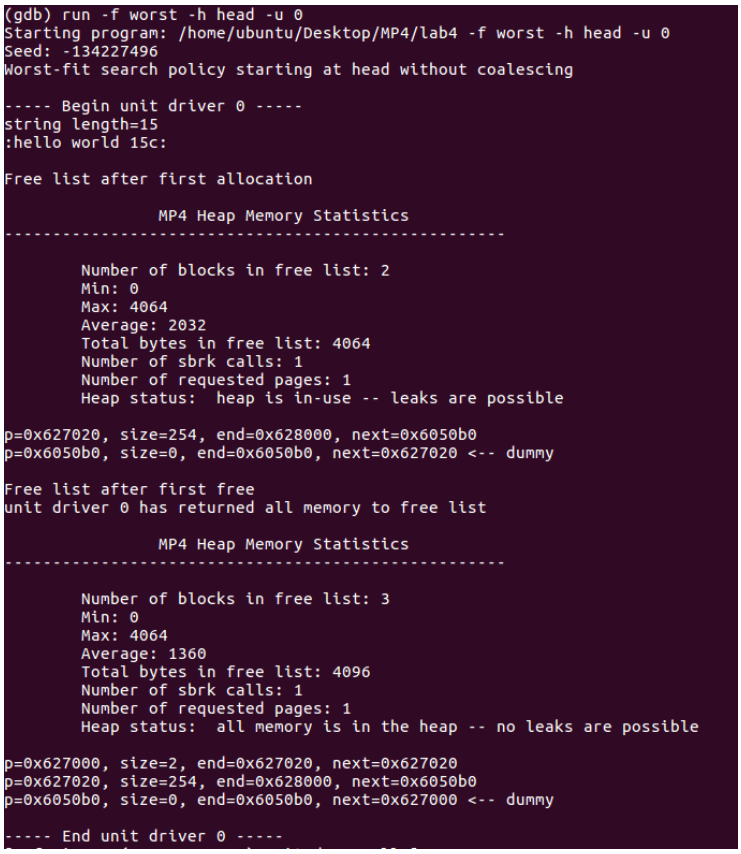
(3) first head unit0.PNG



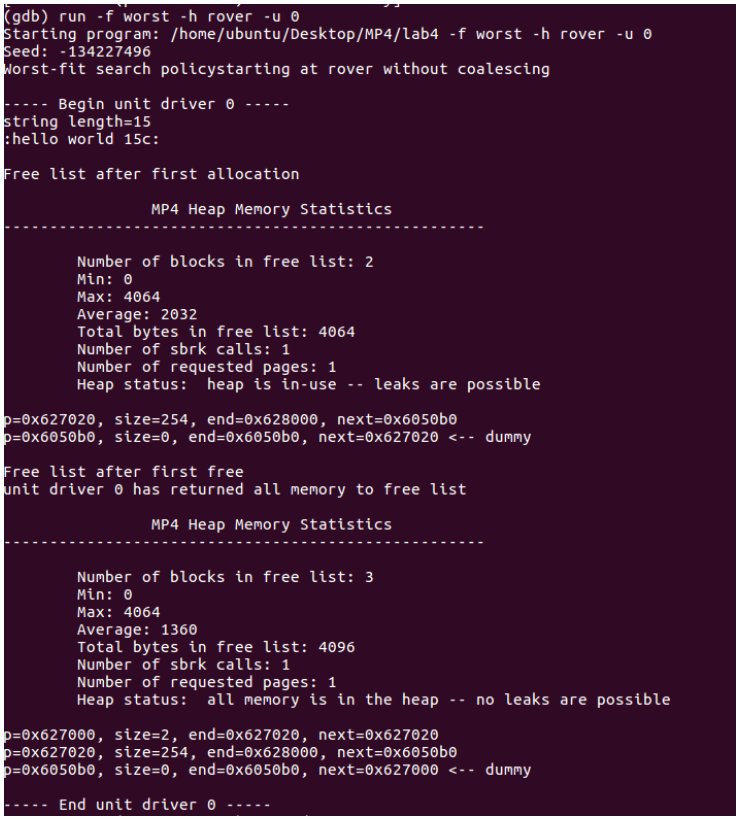
(4) first rover unit0.PNG



(5) worst head unit0.PNG



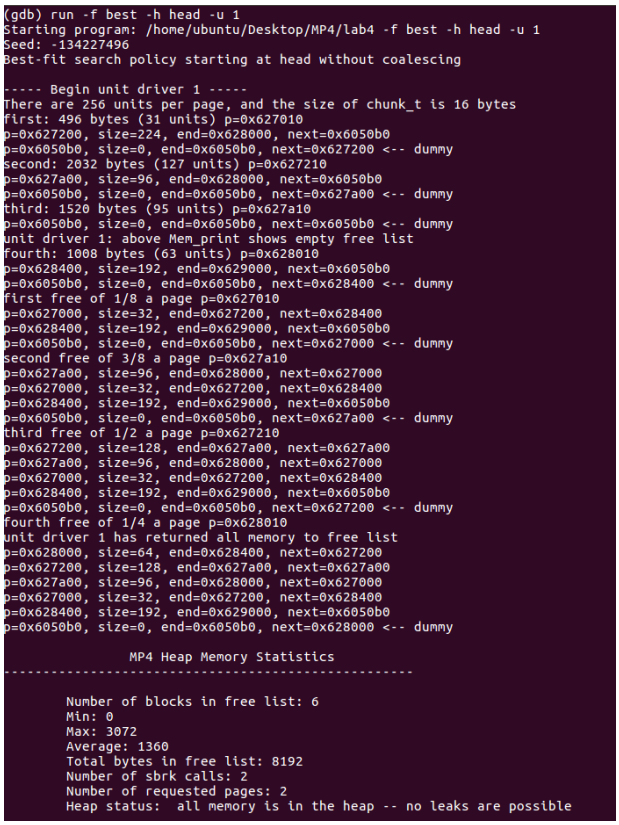
(6) worst rover unit0.PNG



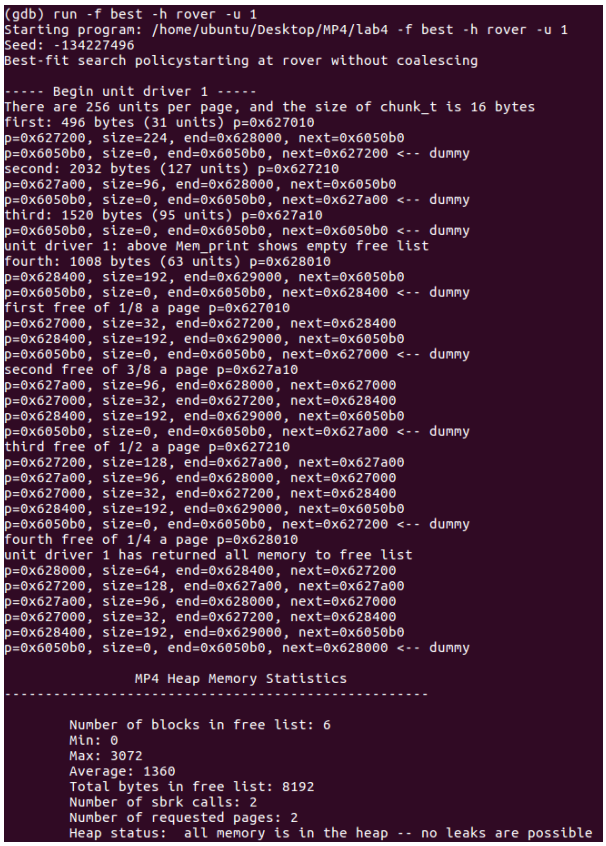
Above are the basic test for unit test 0. Below are the test for unit test 1. they are same too!

And above Mem print of the third allocation should be empty free list!

(7) best head unit1.PNG



(8) best rover unit1.PNG



(9) first head unit1.PNG

```
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f first -h head -u 1
Seed: -134227496
First-fit search policy starting at head without coalescing

----- Begin unit driver 1 -----
There are 256 units per page, and the size of chunk_t is 16 bytes
first: 496 bytes (31 units) p=0x627010
p=0x627200, size=224, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627200 <-- dummy
second: 2032 bytes (127 units) p=0x627210
p=0x627a00, size=96, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627a00 <-- dummy
third: 1520 bytes (95 units) p=0x627a10
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
unit driver 1: above Mem_print shows empty free list
fourth: 1008 bytes (63 units) p=0x628010
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628400 <-- dummy
first free of 1/8 a page p=0x627010
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627000 <-- dummy
second free of 3/8 a page p=0x627a10
p=0x627a00, size=96, end=0x628000, next=0x627000
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627a00 <-- dummy
third free of 1/2 a page p=0x627210
p=0x627200, size=128, end=0x627a00, next=0x627a00
p=0x627a00, size=96, end=0x628000, next=0x627000
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627200 <-- dummy
fourth free of 1/4 a page p=0x628010
unit driver 1 has returned all memory to free list
p=0x628000, size=64, end=0x628400, next=0x627200
p=0x627200, size=128, end=0x627a00, next=0x627a00
p=0x627a00, size=96, end=0x628000, next=0x627000
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628000 <-- dummy

                MP4 Heap Memory Statistics
-----------------------------------------------------

        Number of blocks in free list: 6
        Min: 0
        Max: 3072
        Average: 1360
        Total bytes in free list: 8192
        Number of sbrk calls: 2
        Number of requested pages: 2
        Heap status:  all memory is in the heap -- no leaks are possible
```

(10) first rover unit1.PNG

```
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f first -h rover -u 1
Seed: -134227496
First-fit search policystarting at rover without coalescing

----- Begin unit driver 1 -----
There are 256 units per page, and the size of chunk_t is 16 bytes
first: 496 bytes (31 units) p=0x627010
p=0x627200, size=224, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627200 <-- dummy
second: 2032 bytes (127 units) p=0x627210
p=0x627a00, size=96, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627a00 <-- dummy
third: 1520 bytes (95 units) p=0x627a10
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
unit driver 1: above Mem_print shows empty free list
fourth: 1008 bytes (63 units) p=0x628010
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628400 <-- dummy
first free of 1/8 a page p=0x627010
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627000 <-- dummy
second free of 3/8 a page p=0x627a10
p=0x627a00, size=96, end=0x628000, next=0x627000
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627a00 <-- dummy
third free of 1/2 a page p=0x627210
p=0x627200, size=128, end=0x627a00, next=0x627a00
p=0x627a00, size=96, end=0x628000, next=0x627000
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627200 <-- dummy
fourth free of 1/4 a page p=0x628010
unit driver 1 has returned all memory to free list
p=0x628000, size=64, end=0x628400, next=0x627200
p=0x627200, size=128, end=0x627a00, next=0x627a00
p=0x627a00, size=96, end=0x628000, next=0x627000
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628000 <-- dummy

                MP4 Heap Memory Statistics
-----------------------------------------------------

        Number of blocks in free list: 6
        Min: 0
        Max: 3072
        Average: 1360
        Total bytes in free list: 8192
        Number of sbrk calls: 2
        Number of requested pages: 2
        Heap status:  all memory is in the heap -- no leaks are possible
```

(11) worst head unit1.PNG

```
(gdb) run -f worst -h head -u 1
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f worst -h head -u 1
Seed: -134227496
Worst-fit search policy starting at head without coalescing

----- Begin unit driver 1 -----
There are 256 units per page, and the size of chunk_t is 16 bytes
first: 496 bytes (31 units) p=0x627010
p=0x627200, size=224, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627200 <-- dummy
second: 2032 bytes (127 units) p=0x627210
p=0x627a00, size=96, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627a00 <-- dummy
third: 1520 bytes (95 units) p=0x627a10
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
unit driver 1: above Mem_print shows empty free list
fourth: 1008 bytes (63 units) p=0x628010
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628400 <-- dummy
first free of 1/8 a page p=0x627010
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627000 <-- dummy
second free of 3/8 a page p=0x627a10
p=0x627a00, size=96, end=0x628000, next=0x627000
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627a00 <-- dummy
third free of 1/2 a page p=0x627210
p=0x627200, size=128, end=0x627a00, next=0x627a00
p=0x627a00, size=96, end=0x628000, next=0x627000
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627200 <-- dummy
fourth free of 1/4 a page p=0x628010
unit driver 1 has returned all memory to free list
p=0x628000, size=64, end=0x628400, next=0x627200
p=0x627200, size=128, end=0x627a00, next=0x627a00
p=0x627a00, size=96, end=0x628000, next=0x627000
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628000 <-- dummy

               MP4 Heap Memory Statistics
-------------------------------------------------

        Number of blocks in free list: 6
        Min: 0
        Max: 3072
        Average: 1360
        Total bytes in free list: 8192
        Number of sbrk calls: 2
        Number of requested pages: 2
        Heap status:  all memory is in the heap -- no leaks are possible
```

(12) worst rover unit1.PNG

```
(gdb) run -f worst -h rover -u 1
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f worst -h rover -u 1
Seed: -134227496
Worst-fit search policystarting at rover without coalescing

----- Begin unit driver 1 -----
There are 256 units per page, and the size of chunk_t is 16 bytes
first: 496 bytes (31 units) p=0x627010
p=0x627200, size=224, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627200 <-- dummy
second: 2032 bytes (127 units) p=0x627210
p=0x627a00, size=96, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627a00 <-- dummy
third: 1520 bytes (95 units) p=0x627a10
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
unit driver 1: above Mem_print shows empty free list
fourth: 1008 bytes (63 units) p=0x628010
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628400 <-- dummy
first free of 1/8 a page p=0x627010
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627000 <-- dummy
second free of 3/8 a page p=0x627a10
p=0x627a00, size=96, end=0x628000, next=0x627000
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627a00 <-- dummy
third free of 1/2 a page p=0x627210
p=0x627200, size=128, end=0x627a00, next=0x627a00
p=0x627a00, size=96, end=0x628000, next=0x627000
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627200 <-- dummy
fourth free of 1/4 a page p=0x628010
unit driver 1 has returned all memory to free list
p=0x628000, size=64, end=0x628400, next=0x627200
p=0x627200, size=128, end=0x627a00, next=0x627a00
p=0x627a00, size=96, end=0x628000, next=0x627000
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628000 <-- dummy

               MP4 Heap Memory Statistics
-------------------------------------------------

        Number of blocks in free list: 6
        Min: 0
        Max: 3072
        Average: 1360
        Total bytes in free list: 8192
        Number of sbrk calls: 2
        Number of requested pages: 2
        Heap status:  all memory is in the heap -- no leaks are possible
```

The unit 0, 1tests ends. It proves that the basic functionality of my code is correct.

2.Do the every unit test 2,3,4 to the all kinds of the search method, the unit test plan is shown below:

/* I created three new unit drivers.

Here is a unit test driver to test combinations of
-- request the number of bytes that matches a whole page, and a
size that is one unit smaller than a page
-- request more bytes than in one page

This test makes four allocations from the free list with the goal
of making the allocation the whole page to test if the allocation is exact
(one PAGESIZE - 1), and (one PAGESIZE - 2) so that the free list is left empty
once. And then the third allocation is one PAGESIZE and one PAGESIZE + 1
to test some bigger size of pages. ***The results are supposed to be identical.***
*/

(1) best head unit2.PNG

```
(gdb) run -f best -h head -u 2
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f best -h head -u 2
Seed: -134227496
Best-fit search policy starting at head without coalescing

----- Begin unit driver 2 -----
There are 256 units per page, and the size of chunk_t is 16 bytes
first: 4080 bytes (255 units) p=0x627010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
second: 4064 bytes (254 units) p=0x628010
p=0x628ff0, size=1, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
third: 4096 bytes (256 units) p=0x629010
p=0x62a010, size=255, end=0x62b000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
unit driver 1: above Mem_print shows empty free list
fourth: 4112 bytes (257 units) p=0x62b010
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x62c020
first free of one page - 1 p=0x627010
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x627000
second free of one page - 2 p=0x629010
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x628000
third free of one page p=0x628010
p=0x629000, size=257, end=0x62a010, next=0x628000
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x629000
fourth free of one page + 1 p=0x62b010
unit driver 2 has returned all memory to free list
p=0x62b000, size=258, end=0x62c020, next=0x629000
p=0x629000, size=257, end=0x62a010, next=0x628000
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x62b000
```

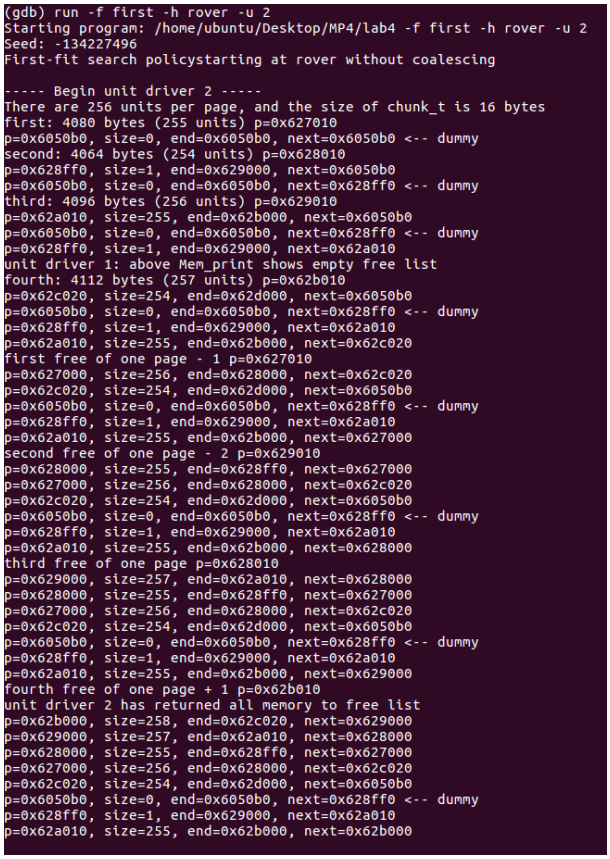
(2) best rover unit2.PNG

```
(gdb) run -f best -h rover -u 2
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f best -h rover -u 2
Seed: -134227496
Best-fit search policystarting at rover without coalescing

----- Begin unit driver 2 -----
There are 256 units per page, and the size of chunk_t is 16 bytes
first: 4080 bytes (255 units) p=0x627010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
second: 4064 bytes (254 units) p=0x628010
p=0x628ff0, size=1, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
third: 4096 bytes (256 units) p=0x629010
p=0x62a010, size=255, end=0x62b000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
unit driver 1: above Mem_print shows empty free list
fourth: 4112 bytes (257 units) p=0x62b010
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x62c020
first free of one page - 1 p=0x627010
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x627000
second free of one page - 2 p=0x629010
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x628000
third free of one page p=0x628010
p=0x629000, size=257, end=0x62a010, next=0x628000
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x629000
fourth free of one page + 1 p=0x62b010
unit driver 2 has returned all memory to free list
p=0x62b000, size=258, end=0x62c020, next=0x629000
p=0x629000, size=257, end=0x62a010, next=0x628000
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x62b000
```

(3) first head unit2.PNG

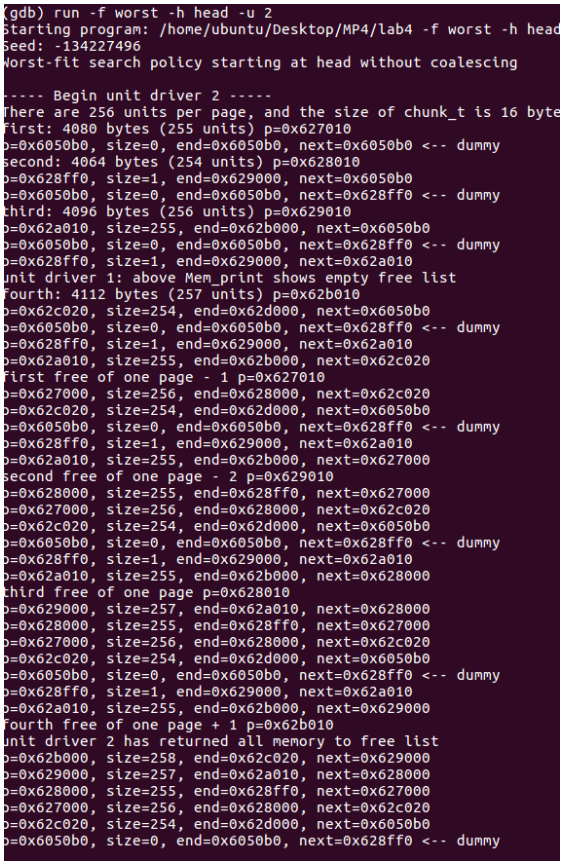
```
(gdb) run -f first -h head -u 2
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f first -h head -u 2
Seed: -134227496
First-fit search policy starting at head without coalescing

----- Begin unit driver 2 -----
There are 256 units per page, and the size of chunk_t is 16 bytes
first: 4080 bytes (255 units) p=0x627010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
second: 4064 bytes (254 units) p=0x628010
p=0x628ff0, size=1, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
third: 4096 bytes (256 units) p=0x629010
p=0x62a010, size=255, end=0x62b000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
unit driver 1: above Mem_print shows empty free list
fourth: 4112 bytes (257 units) p=0x62b010
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x62c020
first free of one page - 1 p=0x627010
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x627000
second free of one page - 2 p=0x629010
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x628000
third free of one page p=0x628010
p=0x629000, size=257, end=0x62a010, next=0x628000
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x629000
fourth free of one page + 1 p=0x62b010
unit driver 2 has returned all memory to free list
p=0x62b000, size=258, end=0x62c020, next=0x629000
p=0x629000, size=257, end=0x62a010, next=0x628000
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x62b000
```

(4) first rover unit2.PNG



```
(gdb) run -f first -h rover -u 2
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f first -h rover -u 2
Seed: -134227496
First-fit search policystarting at rover without coalescing

----- Begin unit driver 2 -----
There are 256 units per page, and the size of chunk_t is 16 bytes
first: 4080 bytes (255 units) p=0x627010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
second: 4064 bytes (254 units) p=0x628010
p=0x628ff0, size=1, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
third: 4096 bytes (256 units) p=0x629010
p=0x62a010, size=255, end=0x62b000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
unit driver 1: above Mem_print shows empty free list
fourth: 4112 bytes (257 units) p=0x62b010
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x62c020
first free of one page - 1 p=0x627010
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x627000
second free of one page - 2 p=0x629010
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x628000
third free of one page p=0x628010
p=0x629000, size=257, end=0x62a010, next=0x628000
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x629000
fourth free of one page + 1 p=0x62b010
unit driver 2 has returned all memory to free list
p=0x62b000, size=258, end=0x62c020, next=0x629000
p=0x629000, size=257, end=0x62a010, next=0x628000
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x62b000
```

(5) worst head unit2.PNG



```
(gdb) run -f worst -h head -u 2
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f worst -h head
Seed: -134227496
Worst-fit search policy starting at head without coalescing

----- Begin unit driver 2 -----
There are 256 units per page, and the size of chunk_t is 16 bytes
first: 4080 bytes (255 units) p=0x627010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
second: 4064 bytes (254 units) p=0x628010
p=0x628ff0, size=1, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
third: 4096 bytes (256 units) p=0x629010
p=0x62a010, size=255, end=0x62b000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
unit driver 1: above Mem_print shows empty free list
fourth: 4112 bytes (257 units) p=0x62b010
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x62c020
first free of one page - 1 p=0x627010
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x627000
second free of one page - 2 p=0x629010
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x628000
third free of one page p=0x628010
p=0x629000, size=257, end=0x62a010, next=0x628000
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x629000
fourth free of one page + 1 p=0x62b010
unit driver 2 has returned all memory to free list
p=0x62b000, size=258, end=0x62c020, next=0x629000
p=0x629000, size=257, end=0x62a010, next=0x628000
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
```

(6) worst rover unit2.PNG

```
----- Begin unit driver 2 -----
There are 256 units per page, and the size of chunk_t is 16 bytes
first: 4080 bytes (255 units) p=0x627010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
second: 4064 bytes (254 units) p=0x628010
p=0x628ff0, size=1, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
third: 4096 bytes (256 units) p=0x629010
p=0x62a010, size=255, end=0x62b000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
unit driver 1: above Mem_print shows empty free list
fourth: 4112 bytes (257 units) p=0x62b010
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x62c020
first free of one page - 1 p=0x627010
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x627000
second free of one page - 2 p=0x629010
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x628000
third free of one page p=0x628010
p=0x629000, size=257, end=0x62a010, next=0x628000
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x629000
fourth free of one page + 1 p=0x62b010
unit driver 2 has returned all memory to free list
p=0x62b000, size=258, end=0x62c020, next=0x629000
p=0x629000, size=257, end=0x62a010, next=0x628000
p=0x628000, size=255, end=0x628ff0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x62c020
p=0x62c020, size=254, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy
p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x62b000

               MP4 Heap Memory Statistics
-------------------------------------------------

       Number of blocks in free list: 8
```

(7) The heap: unit2(heap).PNG

```
               MP4 Heap Memory Statistics
-------------------------------------------------------

        Number of blocks in free list: 8
        Min: 0
        Max: 4128
        Average: 3072
        Total bytes in free list: 24576
        Number of sbrk calls: 4
        Number of requested pages: 6
        Heap status:  all memory is in the heap -- no leaks are possible


----- End unit test driver 2 -----
```

Finish testing the unit test 2. It shown that when allocating the 255 units from a 256 sized block, it will left a empty head(chunk_t*) with only a pointer points to next block and size of 1, but not available to use!

Here, is unit test3:

/* I created three new unit drivers.

Here is a unit test driver to test combinations of requests and frees such that the free list is empty

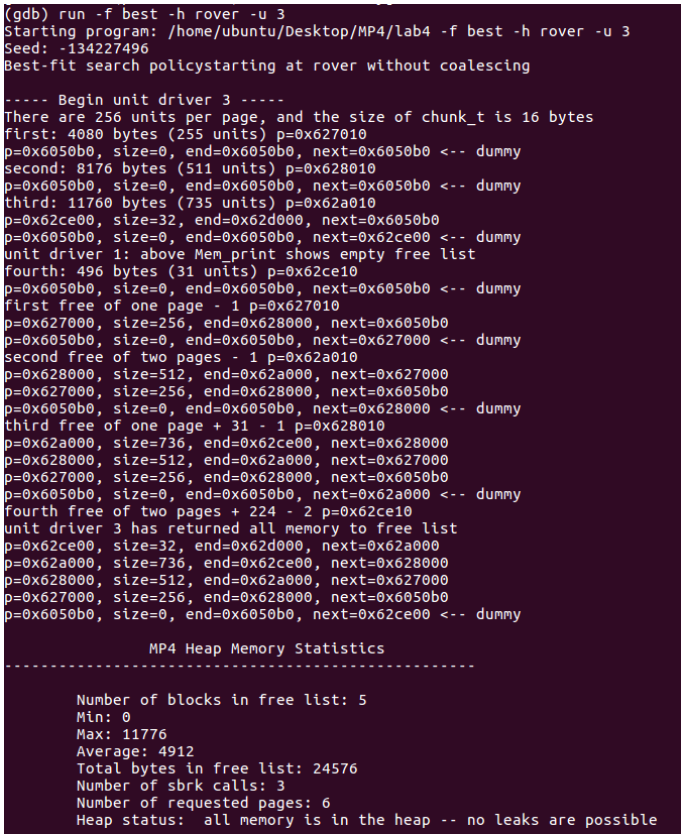
This test makes four allocations from the free list with the goal of making the allocation the whole page to test if the allocation is exact (one PAGESIZE - 1), and (two PAGESIZE - 1)so that the free list is left empty twice. And then the third allocation is some units of 2 * PAGESIZE + 224 - 2 and 31 to test some bigger size of pages. ***The results will be identical, and after the fourth allocation, the list must be empty!***

*/

(8) best head unit3.PNG

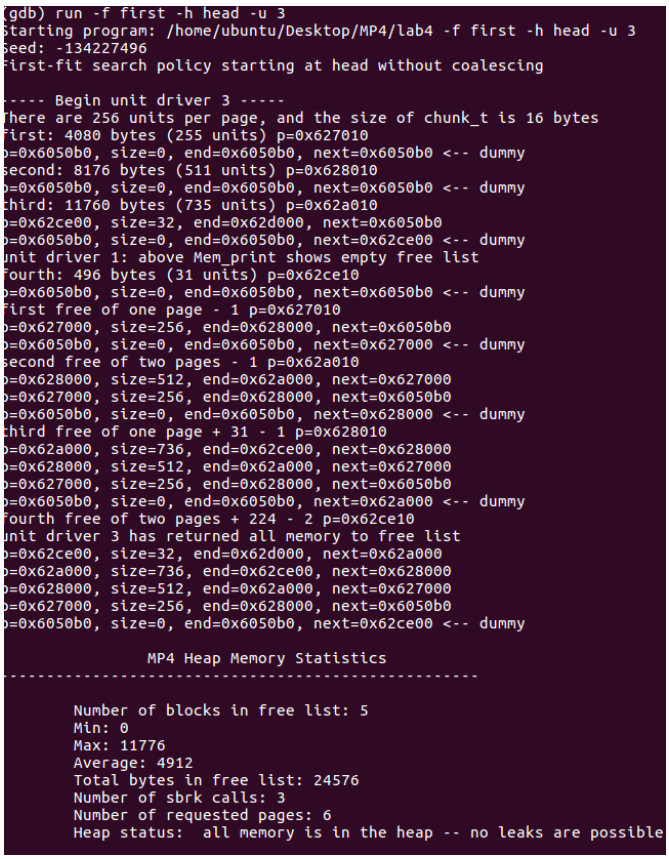
```
(gdb) run -f best -h head -u 3
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f best -h head -u 3
Seed: -134227496
Best-fit search policy starting at head without coalescing

----- Begin unit driver 3 -----
There are 256 units per page, and the size of chunk_t is 16 bytes
first: 4080 bytes (255 units) p=0x627010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
second: 8176 bytes (511 units) p=0x628010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
third: 11760 bytes (735 units) p=0x62a010
p=0x62ce00, size=32, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x62ce00 <-- dummy
unit driver 1: above Mem_print shows empty free list
fourth: 496 bytes (31 units) p=0x62ce10
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
first free of one page - 1 p=0x627010
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627000 <-- dummy
second free of two pages - 1 p=0x62a010
p=0x628000, size=512, end=0x62a000, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628000 <-- dummy
third free of one page + 31 - 1 p=0x628010
p=0x62a000, size=736, end=0x62ce00, next=0x628000
p=0x628000, size=512, end=0x62a000, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x62a000 <-- dummy
fourth free of two pages + 224 - 2 p=0x62ce10
unit driver 3 has returned all memory to free list
p=0x62ce00, size=32, end=0x62d000, next=0x62a000
p=0x62a000, size=736, end=0x62ce00, next=0x628000
p=0x628000, size=512, end=0x62a000, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x62ce00 <-- dummy

               MP4 Heap Memory Statistics
-------------------------------------------------

        Number of blocks in free list: 5
        Min: 0
        Max: 11776
        Average: 4912
        Total bytes in free list: 24576
        Number of sbrk calls: 3
        Number of requested pages: 6
        Heap status:  all memory is in the heap -- no leaks are possible


----- End unit test driver 3 -----
```

(9) best rover unit3.PNG



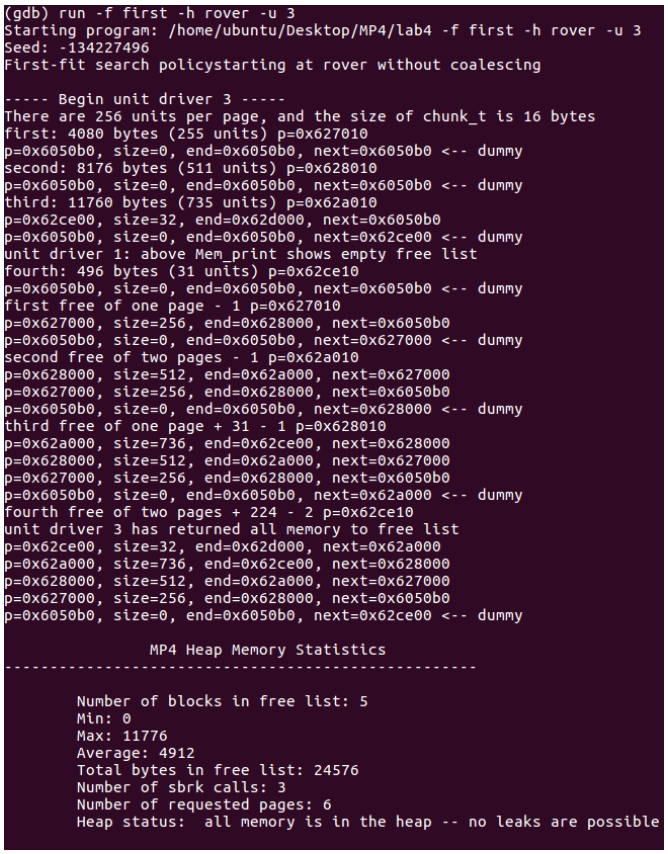
```
(gdb) run -f best -h rover -u 3
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f best -h rover -u 3
Seed: -134227496
Best-fit search policystarting at rover without coalescing

----- Begin unit driver 3 -----
There are 256 units per page, and the size of chunk_t is 16 bytes
first: 4080 bytes (255 units) p=0x627010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
second: 8176 bytes (511 units) p=0x628010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
third: 11760 bytes (735 units) p=0x62a010
p=0x62ce00, size=32, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x62ce00 <-- dummy
unit driver 1: above Mem_print shows empty free list
fourth: 496 bytes (31 units) p=0x62ce10
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
first free of one page - 1 p=0x627010
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627000 <-- dummy
second free of two pages - 1 p=0x62a010
p=0x628000, size=512, end=0x62a000, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628000 <-- dummy
third free of one page + 31 - 1 p=0x628010
p=0x62a000, size=736, end=0x62ce00, next=0x628000
p=0x628000, size=512, end=0x62a000, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x62a000 <-- dummy
fourth free of two pages + 224 - 2 p=0x62ce10
unit driver 3 has returned all memory to free list
p=0x62ce00, size=32, end=0x62d000, next=0x62a000
p=0x62a000, size=736, end=0x62ce00, next=0x628000
p=0x628000, size=512, end=0x62a000, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x62ce00 <-- dummy

                MP4 Heap Memory Statistics
-------------------------------------------------

        Number of blocks in free list: 5
        Min: 0
        Max: 11776
        Average: 4912
        Total bytes in free list: 24576
        Number of sbrk calls: 3
        Number of requested pages: 6
        Heap status:  all memory is in the heap -- no leaks are possible
```

(10) first head unit3.PNG



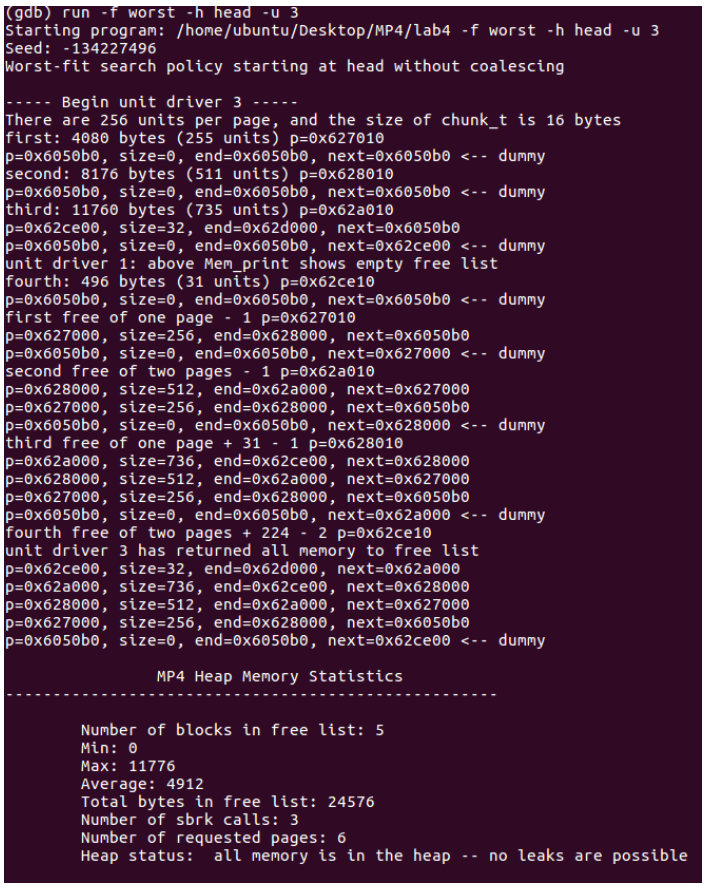
```
(gdb) run -f first -h head -u 3
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f first -h head -u 3
Seed: -134227496
First-fit search policy starting at head without coalescing

----- Begin unit driver 3 -----
There are 256 units per page, and the size of chunk_t is 16 bytes
first: 4080 bytes (255 units) p=0x627010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
second: 8176 bytes (511 units) p=0x628010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
third: 11760 bytes (735 units) p=0x62a010
p=0x62ce00, size=32, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x62ce00 <-- dummy
unit driver 1: above Mem_print shows empty free list
fourth: 496 bytes (31 units) p=0x62ce10
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
first free of one page - 1 p=0x627010
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627000 <-- dummy
second free of two pages - 1 p=0x62a010
p=0x628000, size=512, end=0x62a000, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628000 <-- dummy
third free of one page + 31 - 1 p=0x628010
p=0x62a000, size=736, end=0x62ce00, next=0x628000
p=0x628000, size=512, end=0x62a000, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x62a000 <-- dummy
fourth free of two pages + 224 - 2 p=0x62ce10
unit driver 3 has returned all memory to free list
p=0x62ce00, size=32, end=0x62d000, next=0x62a000
p=0x62a000, size=736, end=0x62ce00, next=0x628000
p=0x628000, size=512, end=0x62a000, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x62ce00 <-- dummy

                MP4 Heap Memory Statistics
-------------------------------------------------

        Number of blocks in free list: 5
        Min: 0
        Max: 11776
        Average: 4912
        Total bytes in free list: 24576
        Number of sbrk calls: 3
        Number of requested pages: 6
        Heap status:  all memory is in the heap -- no leaks are possible
```

(11) first rover unit3.PNG



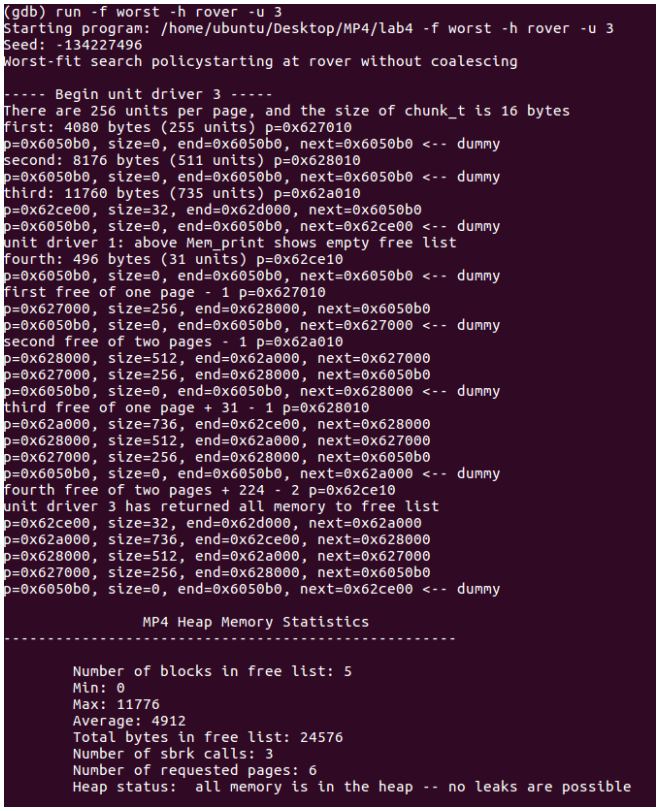
```
(gdb) run -f first -h rover -u 3
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f first -h rover -u 3
Seed: -134227496
First-fit search policystarting at rover without coalescing

----- Begin unit driver 3 -----
There are 256 units per page, and the size of chunk_t is 16 bytes
first: 4080 bytes (255 units) p=0x627010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
second: 8176 bytes (511 units) p=0x628010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
third: 11760 bytes (735 units) p=0x62a010
p=0x62ce00, size=32, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x62ce00 <-- dummy
unit driver 1: above Mem_print shows empty free list
fourth: 496 bytes (31 units) p=0x62ce10
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
first free of one page - 1 p=0x627010
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627000 <-- dummy
second free of two pages - 1 p=0x62a010
p=0x628000, size=512, end=0x62a000, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628000 <-- dummy
third free of one page + 31 - 1 p=0x628010
p=0x62a000, size=736, end=0x62ce00, next=0x628000
p=0x628000, size=512, end=0x62a000, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x62a000 <-- dummy
fourth free of two pages + 224 - 2 p=0x62ce10
unit driver 3 has returned all memory to free list
p=0x62ce00, size=32, end=0x62d000, next=0x62a000
p=0x62a000, size=736, end=0x62ce00, next=0x628000
p=0x628000, size=512, end=0x62a000, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x62ce00 <-- dummy

               MP4 Heap Memory Statistics
-------------------------------------------------

        Number of blocks in free list: 5
        Min: 0
        Max: 11776
        Average: 4912
        Total bytes in free list: 24576
        Number of sbrk calls: 3
        Number of requested pages: 6
        Heap status:  all memory is in the heap -- no leaks are possible
```

(12) worst head unit3.PNG



```
(gdb) run -f worst -h head -u 3
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f worst -h head -u 3
Seed: -134227496
Worst-fit search policy starting at head without coalescing

----- Begin unit driver 3 -----
There are 256 units per page, and the size of chunk_t is 16 bytes
first: 4080 bytes (255 units) p=0x627010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
second: 8176 bytes (511 units) p=0x628010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
third: 11760 bytes (735 units) p=0x62a010
p=0x62ce00, size=32, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x62ce00 <-- dummy
unit driver 1: above Mem_print shows empty free list
fourth: 496 bytes (31 units) p=0x62ce10
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
first free of one page - 1 p=0x627010
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x627000 <-- dummy
second free of two pages - 1 p=0x62a010
p=0x628000, size=512, end=0x62a000, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628000 <-- dummy
third free of one page + 31 - 1 p=0x628010
p=0x62a000, size=736, end=0x62ce00, next=0x628000
p=0x628000, size=512, end=0x62a000, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x62a000 <-- dummy
fourth free of two pages + 224 - 2 p=0x62ce10
unit driver 3 has returned all memory to free list
p=0x62ce00, size=32, end=0x62d000, next=0x62a000
p=0x62a000, size=736, end=0x62ce00, next=0x628000
p=0x628000, size=512, end=0x62a000, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x62ce00 <-- dummy

               MP4 Heap Memory Statistics
-------------------------------------------------

        Number of blocks in free list: 5
        Min: 0
        Max: 11776
        Average: 4912
        Total bytes in free list: 24576
        Number of sbrk calls: 3
        Number of requested pages: 6
        Heap status:  all memory is in the heap -- no leaks are possible
```

(13) worst rover unit3.PNG



Finished the unit test three, ***all of them are constant and correct for my expectation.***

Here: unit test 4:

/* I created three new unit drivers.

Here is a unit test driver to test the difference between the best fit ,first fit and worst fit.

This test makes six allocations from the free list with the goal
of making the allocation to have the significant difference between three SearchPolicy.

first allocate: (PAGESIZE/SIZEOF_CHUNK_T + 60) - 1 unit size
second allocate: (PAGESIZE/SIZEOF_CHUNK_T + 120) - 1 unit size
third allocate: (PAGESIZE/SIZEOF_CHUNK_T + 180) - 1 unit size
The memory chunk size after FIRST THREE allocation will be:

```
          **      **    **     *      *
Dummy-> \\ 256 \\ ->\\ 60 \ 196 \ ->>
^         **      **    **     *      *                    |
^    <<<<<<<<<<<<<<<<<<<<<<<<<<
^    |    **      **    **      *      *
^    >>\\ 256 \\ ->\\ 120 \ 136 \ ->
^         **      **    **      *      *          |
^    <<<<<<<<<<<<<<<<<<<<<<
^    |    **      **    **      *     *
^    >>\\ 256 \\ ->\\ 180 \ 76 \ ->>>>>>>>>>>>>>>>>
^         **      **    **      *     *                                |
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
```

^^^^^^^^^^^^

consider the right chunks

Fourth allocate: (76 - 1) unit size
Fifth allocate: (60 - 1) unit size
Sixth allocate: (76 - 1) unit size

The memory chunk size after LAST THREE allocation will be:

(1).best fit: 1* 196 136 (76 - 76 = nil)
2* 196 76 (136 -60 = 76)
3* 196 (76 - 76 = nil)Rover_first or head_first are the same

(2).first fit:1* 120 136 76 (196 - (76))
2* 60 136 76 (120 - (60))
3* 60 60 76 (136 - (76)) This is head_first. Rover_first will be:

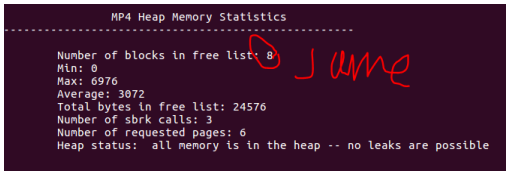
1* 196 136 (76 - 76 = nil) (Rover is on the last new node!)
2* 136 136 (196 - 60) (Rover is moved to next available!)
3* 60 136 (136 - 76) (Rover stays 'cause the node is ready!)

(3).worst fit:1* 120 136 76 (196 - (76))
2* 120 76 76 (136 - (60))
3* 44 76 76 (120 - (76)) Rover_first or head_first are the same

I wanna show that the first fit and the worst fit are very inefficient, they generate very similar consequences when in head first, and the best fit is the most efficient. But the first_fit Policy will definitely different from where the Rover starts.
*/

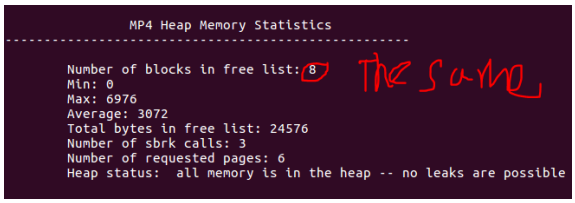
(14) best head unit4.PNG

(15) best head unit4(heap).PNG 8 in the free list!



(16) best rover unit4.PNG

(17) best rover unit4(heap).PNG 8 in the free list!



(18) worst head unit4.PNG(identical)

(19) worst rover unit4.PNG(identical)

(20) worst rover unit4(heap).PNG size are more than that using the bestfit!

```
              MP4 Heap Memory Statistics
-------------------------------------------------

       Number of blocks in free list: 10
       Min: 0
       Max: 6976
       Average: 2448
       Total bytes in free list: 24576
       Number of sbrk calls: 3
       Number of requested pages: 6
       Heap status:  all memory is in the heap -- no leaks are possible
```

```
              MP4 Heap Memory Statistics
-------------------------------------------------

       Number of blocks in free list: 8
       Min: 0
       Max: 6976
       Average: 3072
       Total bytes in free list: 24576
       Number of sbrk calls: 3
       Number of requested pages: 6
       Heap status:  all memory is in the heap -- no leaks are possible
```

The worst fit can not allocate the memory efficiently, causing more fragments! The best fit are making more use of the memory blocks.

(21) The most interesting one: first fit: first head unit4.PNG

```
(gdb) run -f first -h head -u 4
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f first -h head -u 4
Seed: -134227496
First-fit search policy starting at head without coalescing

----- Begin unit driver 4 -----
There are 256 units per page, and the size of chunk_t is 16 bytes
first: 5040 bytes (315 units) p=0x627010
p=0x6283c0, size=196, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6283c0 <-- dummy
second: 6000 bytes (375 units) p=0x629010
p=0x62a780, size=136, end=0x62b000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6283c0 <-- dummy
p=0x6283c0, size=196, end=0x629000, next=0x62a780
third: 6960 bytes (435 units) p=0x62b010
p=0x62cb40, size=76, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6283c0 <-- dummy
p=0x6283c0, size=196, end=0x629000, next=0x62a780
p=0x62a780, size=136, end=0x62b000, next=0x62cb40
unit driver 4: above are FIRST THREE allocation
fourth: 1200 bytes (75 units) p=0x6283d0
p=0x628880, size=120, end=0x629000, next=0x62a780
p=0x62a780, size=136, end=0x62b000, next=0x62cb40
p=0x62cb40, size=76, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628880 <-- dummy
fifth: 944 bytes (59 units) p=0x628890
p=0x628c40, size=60, end=0x629000, next=0x62a780
p=0x62a780, size=136, end=0x62b000, next=0x62cb40
p=0x62cb40, size=76, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628c40 <-- dummy
sixth: 1200 bytes (75 units) p=0x62a790
p=0x62ac40, size=60, end=0x62b000, next=0x62cb40
p=0x62cb40, size=76, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628c40 <-- dummy
p=0x628c40, size=60, end=0x629000, next=0x62ac40
unit driver 4: above are LAST THREE allocation
```

```
              MP4 Heap Memory Statistics
-------------------------------------------------

       Number of blocks in free list: 10
       Min: 0
       Max: 6976
       Average: 2448
       Total bytes in free list: 24576
       Number of sbrk calls: 3
       Number of requested pages: 6
       Heap status:  all memory is in the heap -- no leaks are possible
```

But, in Rover_first: It used up a block! make it more space for system and user!

(22) first rover unit4-1.PNG

first rover unit4-1.PNG