# 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

(2) best rover unit0.PNG

#### (3) first head unit0.PNG

```
(gdb) run -u 0
Starting program: /home/ubuntu/Desktop/MP4/lab4 -u 0
Seed: -134227496
First-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: 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=0x6050b0
p=0x627020, size=24, end=0x627020, next=0x627020
p=0x627020, size=254, end=0x628000, next=0x6050b0
p=0x607020, size=2, end=0x6050b0, next=0x607000 <-- dummy
------
End unit driver 0 -----
```

#### (4) first rover unit0.PNG

#### (5) worst head unit0.PNG

```
(gdb) run -f worst -h head -u 0
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f worst -h head -u 0
Seed: -134227496
Worst-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
              Max: 4004
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
              Max: 4004
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 -----
```

## (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

```
(gdb) run -f best -h head -u 1
Starting program: /hone/ubuntu/Desktop/MP4/lab4 -f best -h head -u 1
Seed: :134227496
Best-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=0x627200 <-- dummy
second: 2032 bytes (127 units) p=0x627210
p=0x627200, size=20, end=0x6050b0, next=0x627200 <-- dummy
second: 2032 bytes (127 units) p=0x627210
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
third: 1520 bytes (95 units) p=0x627210
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=0x6029000, next=0x628400 <-- dummy
first free of 1/8 a page p=0x627010
p=0x628400, size=192, end=0x6050b0, next=0x628400 <-- dummy
second free of 3/8 a page p=0x627210
p=0x627000, size=30, end=0x6050b0, next=0x627000 <-- dummy
second free of 3/8 a page p=0x627210
p=0x627000, size=30, end=0x6050b0, next=0x627000 <-- dummy
second free of 3/8 a page p=0x627210
p=0x627000, size=30, end=0x6050b0, next=0x627000 <-- dummy
second free of 3/8 a page p=0x627210
p=0x627000, size=312, end=0x627200, next=0x627000
p=0x627000, size=32, end=0x627200, next=0x627000
p=0x627000, size=32, end=0x627000, next=0x627000
p=0x627000, size=32, end=0x627000, next=0x627000
p=0x627000, size=32, end=0x627000, next=0x627000
p=0x627000, size=128, end=0x627000, next=0x627000
p=0x627000, size=32, end=0x627000, next=0x627000
p=0x627000, siz
```

# (8) best rover unit1.PNG

```
(gdb) run -f best -h rover -u 1
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f best -h rover -u 1
Seed: -134227496
Best-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=0x627200 <-- dummy
second: 2032 bytes (127 units) p=0x627210
p=0x627300, size=0, end=0x6050b0, next=0x627200 <-- dummy
second: 2032 bytes (127 units) p=0x627210
p=0x627300, size=0, end=0x6050b0, next=0x627200 <-- dummy
third: 1520 bytes (95 units) p=0x627310
p=0x6050b0, size=0, end=0x6050b0, next=0x627300 <-- dummy
third: 1520 bytes (95 units) p=0x627310
p=0x628400, size=0, end=0x6050b0, next=0x6050b0
=0x6050b0, size=0, end=0x6050b0, next=0x6050b0
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x628400, size=32, end=0x627000, next=0x628400
p=0x628400, size=32, end=0x627000, next=0x628400
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x628400, size=192, end=0x629000, next=0x627000
p=0x627000, size=32, end=0x627000, next=0x627000
p=0x627000, size=32, end=0x629000, next=0x627000
p=0x627000, size=32, end=0x627000, next=0x627000
p=0x627000, size=32, end=0x627000
p=0x627000, size=32, end=0
```

# (9) first head unit1.PNG

# (10) first rover unit1.PNG

#### (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=0x606300b, size=0, end=0x60500b0, next=0x607200 <-- dummy
second: 2032 bytes (127 units) p=0x627210
p=0x627300, size=6, end=0x628000, next=0x6050b0
p=0x626300, size=0, end=0x6050b0, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
third: 1520 bytes (95 units) p=0x627210
p=0x607300, size=9, end=0x6050b0, next=0x6050b0 <-- dummy
unit driver 1: above Mem print shows empty free list
fourth: 1080 bytes (63 units) p=0x628010
p=0x628400, size=192, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0
p=0x628400, size=192, end=0x627000
p=0x627000, size=32, end=0x627000, next=0x628400
p=0x628400, size=192, end=0x627000, next=0x628400
p=0x628400, size=0, end=0x629000, next=0x628400
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x627000, size=32, end=0x627200, next=0x628400
p=0x628400, size=0, end=0x628000, next=0x627000
p=0x627000, size=32, end=0x627200, next=0x62800
p=0x628000, size=0, end=0x628000, next=0x627000
p=0x627000, size=32, end=0x627200, next=0x627000
p=0x627000, size=32, end=0x627000, next=0x628000
p=0x627000, size=32, end=0x627000, next=0x628000
p=0x627000, size=32, end=0x627000, next=0x628000
p=0x627000, size=32, end=0x627000, next=0x628000
p=0x627000, size=32, end=0x627000
p=0x627000, size=32, end=0x627000
p=0x62
```

# (12) worst rover unit1.PNG

The unit 0, 1 tests 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 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=0x672010, size=255 end=0x62b000 next=0x6050b0
p=0x62a010, size=255, end=0x62b000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <---
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=0x628000, next=0x63050b0
 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=0x62c020, Size=2.94, end=0x6020000, next=0x608000
p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <
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=0x677000, size=256, end=0x628000, next=0x62626000
                                                                                                                  dummv
 p=0x627000, size=256, end=0x628000, next=0x62c020
 p=0x62c020, size=254, end=0x62d000, next=0x6050b0
 p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0
p=0x0628ff0, size=1, end=0x0629000, next=0x0628ff0
p=0x628ff0, size=1, end=0x629000, next=0x628010
p=0x628f0, 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
  o=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
```

# (3) first head unit2.PNG

```
(gdb) run -f first -h head -u 2
Starting program: /home/ubuntu/besktop/MP4/lab4 -f first -h head -u 2
Seed: -134227496
First-fit search policy starting at head without coalescing
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f first -h head -t Seed: -13427496
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=0x620010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 p=0x6050b0, size=0, end=0x6050b0, next=0x620010 unit driver 1: above Mem_print shows empty free list fourth: 4112 bytes (257 units) p=0x62b010 p=0x62b010, size=25, end=0x6050b0, next=0x620010 p=0x6050b0, size=0, end=0x6050b0, next=0x62000 p=0x6050b0, size=0, end=0x6050b0, next=0x62000 p=0x6050b0, size=0, end=0x6050b0, next=0x62000 p=0x6250010, size=255, end=0x62b000, next=0x62c020 p=0x62c020, size=254, end=0x62d000, next=0x62c020 p=0x62c020, size=255, end=0x62b000, next=0x62c020 p=0x62c020, size=254, end=0x62d000, next=0x62c020 p=0x62c020, size=255, end=0x62b000, next=0x627000 p=0x62s010, size=255, end=0x62b000, next=0x627000 p=0x62s010, size=255, end=0x62b000, next=0x627000 p=0x62c020, size=254, end=0x62b000, next=0x627000 p=0x62c020, size=255, end=0x62b000, next=0x620000 p=0x62b000, size=255, end=0x62b000, next=0x620000 p=0x62b000, size=255, end=0x62b000, next=0x620000 p=0x62b000, size=255, end=0x62b000, next=0x62b000 p=0x62b000, size=255, end=0x62b000, next=
```

#### (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=0x6850b0, size=0, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x629000, next=0x6280f0 <-- dummy
third: 4096 bytes (256 units) p=0x629010
p=0x628160, size=2, end=0x629000, next=0x628160 <-- dummy
p=0x628160, size=1, end=0x629000, next=0x628160 <-- dummy
p=0x628160, size=1, end=0x629000, next=0x628160 <-- dummy
p=0x628161, size=2, end=0x620000, next=0x620000
p=0x628161, size=2, end=0x620000, next=0x620200
first free of one page - 1 p=0x627010
p=0x628010, size=256, end=0x620000, next=0x620200
first free of one page - 1 p=0x627010
p=0x628161, size=1, end=0x629000, next=0x620200
p=0x628161, size=1, end=0x629000, next=0x62010
p=0x628161, size=1, end=0x629000, next=0x62000
p=0x628161, size=1, end=0x629000, next=0x62000
p=0x628161, size=1, end=0x629000, next=0x62000
p=0x628000, size=55, end=0x620000, next=0x62000
p=0x628000, size=55, end=0x620000, next=0x62000
p=0x627000, size=255, end=0x620000, next=0x62000
p=0x627000, size=255, end=0x620000, next=0x62000
p=0x628000, size=55, end=0x620000, next=0x62000
p=0x628000, size=55, end=0x620000, next=0x62000
p=0x62000, size=255, end=0x620000, next
```

# (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
dorst-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 byte first: 4080 bytes (255 units) p=0x627010
-0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy second: 4064 bytes (254 units) p=0x627010
-0x6050b0, size=0, end=0x6050b0, next=0x6050b0
-0x6050b0, size=0, end=0x6050b0, next=0x6050b0
-0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy third: 4096 bytes (256 units) p=0x629010
-0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy 0x628ff0, size=1, end=0x629000, next=0x6050b0
-0x6050b0, size=0, end=0x6050b0, next=0x626010
-0x6050b0, size=0, end=0x6050b0, next=0x6050b0
-0x6050b0, size=0, end=0x6050b0, next=0x6050b0
-0x6050b0, size=0, end=0x6050b0, next=0x6050b0
-0x6050b0, size=0, end=0x6050b0, next=0x6050b0
-0x6050b0, size=0, end=0x629000, next=0x6050b0
-0x6050b0, size=0, end=0x629000, next=0x602000
-0x602010, size=256, end=0x629000, next=0x602000
-0x602000, size=256, end=0x629000, next=0x62000
-0x602000, size=256, end=0x629000, next=0x62000
-0x602000, size=256, end=0x629000, next=0x62000
-0x602000, size=256, end=0x629000, next=0x62000
-0x628ff0, size=1, end=0x629000, next=0x62000
-0x628ff0, size=255, end=0x628ff0, next=0x629000
-0x628ff0, size=1, end=0x629000, next=0x620000
-0x628ff0, size=255, end=0x628000, next=0x620000
-0x628ff0, size=255, end=0x628000, next=0x620000
-0x628000, size=255, end=0x628000
-0x628000, size=255, end=0x628000
-0x628000, size=255, end=0x628000
-0x628000, size=
```

# (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
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=0x625000, next=0x628ff0 <-- dummy second: 4066 bytes (256 units) p=0x628010

p=0x626050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy third: 4096 bytes (256 units) p=0x629010

p=0x623010, size=255, end=0x625000, next=0x6050b0

p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy p=0x628ff0, size=1, end=0x629000, next=0x623010

unit driver 1: above Mem_print shows empty free list fourth: 4112 bytes (257 units) p=0x62b010

p=0x62c020, size=254, end=0x625000, next=0x628ff0 <-- dummy p=0x628ff0, size=0, end=0x6050b0, next=0x628ff0 <-- dummy p=0x628ff0, size=1, end=0x629000, next=0x620020

first free of one page - 1 p=0x627010

p=0x627000, size=256, end=0x628000, next=0x62c020

p=0x62c020, size=254, end=0x622000, next=0x62c020
 p=0x603000, Stze=0, end=0x603000, next=0x628170 < 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=0x62020 p=0x62c020, size=254, end=0x62d000, next=0x60550b0 n=0x6050b00 size=0 end=0x6050b00 next=0x6085ff0 <
   p=0x6050b0, size=0, end=0x6050b0, next=0x628ff0 <-
                                                                                                                                                                                                                                                                                                    dummy
  p=0x628ff0, size=1, end=0x629000, next=0x62a010
p=0x62a010, size=255, end=0x62b000, next=0x62a010
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=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=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 < p=0x628ff0, size=1, end=0x629000, next=0x62a010 p=0x62a010, size=255, end=0x62b000, next=0x62b000
                                                                                                                                                                                                                                                                                                   dummv
                                                                                            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
```

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=0x6856b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
second: 8176 bytes (511 units) p=0x628010
p=0x062060, size=20, end=0x6050b0, next=0x6050b0 <-- dummy
third: 11760 bytes (735 units) p=0x622010
p=0x0620e0, size=32, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0
-cox6050b0, size=0, end=0x6050b0, next=0x6050b0
-cox6050b0, size=0, end=0x6050b0, next=0x6050b0
-cox6050b0, size=0, end=0x6050b0, next=0x607000 <-- dummy
first free of one page - 1 p=0x622010
p=0x627000, size=256, end=0x628000, next=0x627000 <-- dummy
second free of two pages - 1 p=0x622010
p=0x628000, size=0, end=0x6050b0, next=0x627000
p=0x627000, size=256, end=0x628000, next=0x627000
p=0x627000, size=312, end=0x628000, next=0x628000
p=0x628000, size=0, end=0x6050b0, next=0x628000
p=0x628000, size=0, end=0x6050b0, next=0x628000
p=0x628000, size=0, end=0x6050b0, next=0x628000
p=0x628000, size=0, end=0x628000, next=0x628000
p=0x628000, size=0, end=0x6050b0, next=0x628000
p=0x628000, size=0, end=0x6050b0, next=0x628000
p=0x628000, size=0, end=0x6050b0, next=0x628000
p=0x628000, size=0, end=0x628000, next=0x628000
p=0x628000, size=0, end=0x6050b0, next=0x628000
p=0x628000, size=0, end=0x6050b0, next=0x628000
p=0x628000, size=0, size=32, end=0x628000
p=0x628000, size=0, end=0x6050b0, next=0x628000
p=0x628000, size=0, size=32, end=0x628000
p=0x628000, size=0, size=32, end=0x628000
p=0x628000
p=0x628000
size=10, end=0x628000
size=10, end=0x628000
size=10, end=0x628000
size=10, end=0x628000
size=10, end=0x62
```

# (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=0x622010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy third: 11760 bytes (735 units) p=0x6220010
p=0x602600, size=32, end=0x6026000, next=0x6050b0 <-- dummy unit driver 1: above Mem_print shows empty free list fourth: 496 bytes (31 units) p=0x62ce00 <-- dummy first free of one page - 1 p=0x627010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy first free of one page - 1 p=0x627010
p=0x627000, size=0, end=0x6050b0, next=0x6050b0 <-- dummy second free of two pages - 1 p=0x627010
p=0x627000, size=0, end=0x6050b0, next=0x6050b0
p=0x628000, size=512, end=0x628000, next=0x627000
p=0x627000, size=512, end=0x628000, next=0x628000
p=0x628000, size=0, end=0x628000, next=0x628000
p=0x627000, size=0, end=0x628000, next=0x628000
p=0x627000, size=0, end=0x628000, next=0x628000
p=0x628000, size=0, end=0x628000, next=0x628000
p=0x628000, size=0, end=0x628000, next=0x628000
p=0x628000, size=0, end=0x628000, next=0x628000
p=0x627000, size=0, end=0x628000, next=0x628000
p=0x628000, size=32, end=0x628000, next=0x628000
p=0x628000, size=32, end=0x628000, next=0x628000
p=0x628000, size=32, end=0x628000, next=0x628000
p=0x628000, size=32, end=0x628000, next=0x628000
p=0x628000, size=0, end=0x6050b0, next=0x628000
p=0x628000, size=0, end=0x628000, next=0x628000
p=0x628000, size=0, end=0x628000
p=0x628000, size=0, end=0x628000
p=0x628000, size=0, end=0x628000
p=0x628000, size=0,
```

# (10) first head unit3.PNG

## (11) first rover unit3.PNG

# (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: 4808 bytes (255 units) p=0x627010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
second: 8176 bytes (511 units) p=0x6228010
p=0x6050b0, size=0, end=0x60050b0, next=0x6050b0 <-- dummy
third: 11760 bytes (735 units) p=0x62a010
p=0x626000, size=32, end=0x604000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0 <-- dummy
unit driver 1: above Mem_print shows empty free list
fourth: 496 bytes (31 units) p=0x62ze10
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 <-- dummy
second free of two pages - 1 p=0x627010
p=0x627000, size=256, end=0x628000, next=0x627000
p=0x628000, size=0, end=0x6050b0, next=0x627000
p=0x628000, size=0, end=0x6050b0, next=0x628000
p=0x628000, size=0, end=0x6050b0, next=0x628000
p=0x628000, size=0, end=0x628000, next=0x628000
p=0x628000, size=0, end=0x628000, next=0x628000
p=0x628000, size=356, end=0x628000
p=0x628000, size=356, end=0x628000
p=0x628000, size=356, end
```

# (13) worst rover unit3.PNG

```
(gdb) run -f worst -h rover -u 3
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f worst -h rover -u 3
Seed: -134227496
Worst-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=0x622010
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0
-coalescope (size=32), end=0x6050b0, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0
p=0x627000, size=256, end=0x628000
p=0x627000, size=256, end=0x628000
p=0x627000, size=256, end=0x628000
p=0x627000, size=256, end=0x628000
p=0x6280000, size=512, end=0x628000
p=0x6280000, size=5256, end=0x628000
p=0x6280000, size=526, end=0x628000
p=0x6280000, size=526, end=0x628000
p=0x6270000, size=526, end=0x628000
p=0x6280000, size=526, end=0x628000
p=0x6280000
p=0x6280000, size=526, end=0x628000
p=0
```

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:

^^^^^^

#### 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

```
(gdb) run -f best -h head -u 4
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f best -h head -u 4
Seed: -134227496
Best-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=6x627010
p=0x6283c0, size=196, end=0x629000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6050b0
p=0x6050b0, size=0, end=0x62b000, next=0x6050b0
p=0x6050b0, size=0, end=0x62b000, next=0x6283c0 <-- dummy
p=0x6283c0, size=136, end=0x629000, next=0x6283c0 <-- dummy
p=0x6283c0, size=0, end=0x620000, next=0x6283c0 <-- dummy
p=0x6283c0, size=0, end=0x620000, next=0x6283c0 <-- dummy
p=0x6283c0, size=0, end=0x620000, next=0x6283c0 <-- dummy
p=0x6283c0, size=0, end=0x62b000, next=0x6283c0 <-- dummy
p=0x6283c0, size=136, end=0x62b000, next=0x6283c0 <-- dummy
p=0x6283c0, size=0, end=0x62b000, next=0x6283c0 <-- dummy
p=0x6283c0, size=0, end=0x62b000, next=0x6283c0 <-- dummy
p=0x6283c0, size=0, end=0x62b000, next=0x6283c0 <-- dummy
p=0x6283c0, size=196, end=0x629000, next=0x628000
unit driver 4: above are LAST THREE allocation
```

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

```
Number of blocks in free lists 8
Hin: 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
```

#### (16) best rover unit4.PNG

```
(gdb) run -f best -h rover -u 4
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f best -h rover -u 4
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f best -h rover -u 4
Seed: -134227496
Best-fit search policystarting at rover 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=0x623780, size=136, end=0x625000, next=0x6283c0 <-- dummy
p=0x6283c0, size=196, end=0x6050b0, next=0x6283c0 <-- dummy
p=0x6283c0, size=136, end=0x625000, next=0x6226b0
unit driver 4: above are FIRST THREE allocation
fourth: 1200 bytes (75 units) p=0x62cb10
p=0x6050b0, size=196, end=0x6050b0, next=0x6283c0 <-- dummy
p=0x6283c0, size=136, end=0x6050b0, next=0x6050b0
fifth: 944 bytes (59 units) p=0x62a790
p=0x66283c0, size=136, end=0x6050b0, next=0x6050b0
fifth: 1200 bytes (75 units) p=0x62a50
p=0x6650b0, size=0, end=0x6050b0, next=0x6283c0 <-- dummy
p=0x6283c0, size=196, end=0x6050b0, next=0x6283c0 <-- dummy
p=0x6283c0, size=196, end=0x6050b0, next=0x6080b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6080b0
```

# (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!

```
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 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.

Number of sbrk calls: 3
Number of requested pages: 6
Heap status: all memory is in the heap -- no leaks are possible
```

#### (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 (M35 units) p=0x62b010
p=0x62cb40, size=76, end=0x62d000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x6283c0 <--
p=0x6283c0, size=196, end=0x625000, next=0x62a780
p=0x62a780 size=136, end=0x62b000, next=0x62cb40
unit driver above are FIRST THREE allocation
fourth: 1200 bytes (75 units) p=0x628880
                                                                                               dummv
p=0x628880, size=120, end=0x629000, next=0x62a780
p=0x62a780, size=136, end=0x62b000, next=0x62cb40
p=0x62cb40, size=76, end=0x62d000, next=0x605000
p=0x6050b0, size=0, end=0x6050b0, next=0x628880 <-- dummy
fifth: 944 bytes (59 units) p=0x628890
p=0x628c40, stze=60 end=0x629000, next=0x62e780
p=0x62a780, size=136. end=0x62b000, next=0x62cb40 — p=0x62cb40, size=76, end=0x62d000, next=0x6050b0 p=0x6050b0, size=0, end=0x6050b0, next=0x628c40 <--
                                                                                               dummv
p=0x003000, Stze=0, Fnd=0x633000, next=0x628C40 <--
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 <--
p=0x628c40 size=60. end=0x629000, next=0x62ac40
                                                                                               dummy
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

```
(gdb) run -f first -h rover -u 4
Starting program: /home/ubuntu/Desktop/MP4/lab4 -f first -h rover
Seed: -134227496
 First-fit search policystarting at rover 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=0x0030b0
p=0x6050bg, size=0, end=0x6050b0, next=0x6283c0 <--
p=0x6283c0, size=196, end=0x629000, next=0x62a780
                                                                                                           dymmy
p=0x62a780, size=136, end=0x62b000, next=0x62cb40
unit drive 4: above are FIRST THREE allocation
fourth: 1200 bytes (75 units) p=0x62cb50
p=0x6050b0, size=0, end=0x6050b0, next=0x6283c0 <-- dummy p=0x6283c0, size=196, end=0x629000, next=0x62a780 p=0x62a780, size=136, end=0x62b000, next=0x6050b0 fifth: 944 bytes (59 units) p=0x6283d0
p=0x628780, size=136, end=0x629000, next=0x62a780
p=0x62a780, size=136, end=0x62b000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628780 <-- dummy
sixth: 1200 bytes (75 units) p=0x628790
p=0x628c40, size=60, end=0x629000, next=0x62a780
p=0x62a780, size=136, end=0x62b000, next=0x6050b0
p=0x6050b0, size=0, end=0x6050b0, next=0x628c40 <-- dummy
unit driver 4: above are LAST THREE allocation
```

first rover unit4-1.PNG

```
MP4 Heap Memory Statistics

Number of blocks in free list: 9
Min: 0
Max: 6976
Average: 2720
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
```