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CSE3320-001

Report On Malloc Assignment

Executive summary

Description of the algorithms implemented

In our Operating Systems class, we had to build a malloc algorithm, and free. This assignment we created code that has to react to the operating system. The code must output “heap management statistics.” Which included mallocs, frees, reuses, grows, splits, coalesces, blocks, requested, and max heap. We also had to put our own code to the test by making our own tests. Not to mention, we had to create our own tests in order to really see if our code has any segmentation faults.

Test implementation

I had to implement a lot of code including best fit, worst fit, next fit, and first fit. We also had to get a baseline by doing ffnf at the end. Then we had to run it for the base of the tests we had. Then finally we had to run it on our own tests that we created. Not to mention we had to implement realloc, and calloc. Among editing the previous code to get into the operating system.

Test results for all five candidates

Now this part is tricky because I don’t know what specifically you want us to record for our data. Thus, I am going to screenshot all of my findings: Note I fixed the core dumped part after taking a screen shot.

(time)env LD_PRELOAD=lib/libmalloc1)____ 2)____/3)_____

- 1) ff, wf, nf, ff
- 2) MyTest1, MyTest2, MyTest3, MyTest4
- 3) bfwf, fnff That’s it?

```

● @mxt2753 →/workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-bf.so tests/MyTest1
Running test 1 to test a simple malloc and free
Yay, test is good!!

heap management statistics
mallocs:      2
frees:        1
reuses:       0
grows:        2
splits:       0
coalesces:    0
blocks:       2
requested:    71024
max heap:     71072

real    0m0.014s
user    0m0.003s
sys     0m0.003s

```

```

● @mxt2753 →/workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-ff.so tests/MyTest1
Running test 1 to test a simple malloc and free
Yay, test is good!!

heap management statistics
mallocs:      2
frees:        1
reuses:       0
grows:        2
splits:       0
coalesces:    0
blocks:       2
requested:    71024
max heap:     71072

real    0m0.008s
user    0m0.004s
sys     0m0.003s
○ @mxt2753 →/workspaces/malloc-mxt2753 (master) $

```

```

● @mxt2753 →/workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-nf.so tests/MyTest1
Running test 1 to test a simple malloc and free
Yay, test is good!!

heap management statistics
mallocs:      2
frees:        1
reuses:       1
grows:        1
splits:       0
coalesces:    0
blocks:       1
requested:    71024
max heap:     1048

real    0m0.008s
user    0m0.005s
sys     0m0.000s

```

```

● @mxt2753 →/workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-wf.so tests/MyTest1
Running test 1 to test a simple malloc and free
Yay, test is good!!

heap management statistics
mallocs:      2
frees:        1
reuses:       0
grows:        2
splits:       0
coalesces:    0
blocks:       2
requested:    71024
max heap:     71072

real    0m0.005s
user    0m0.003s
sys     0m0.002s

```

```

@mx2753 → /workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-ff.so tests/MyTest2
Running test 2 to exercise malloc and free
Yay, test is good!!

heap management statistics
mallocs:      1027
frees:        514
reuses:       1
grows:        1026
splits:       1
coalesces:    2
blocks:       1025
requested:    1180672
max heap:     1139760

real    0m0.011s
user    0m0.007s
sys     0m0.004s

```

```

@mx2753 → /workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-bf.so tests/MyTest2
Running test 2 to exercise malloc and free
Yay, test is good!!

heap management statistics
mallocs:      1027
frees:        514
reuses:       1
grows:        1026
splits:       1
coalesces:    2
blocks:       1025
requested:    1180672
max heap:     1139760

real    0m0.011s
user    0m0.010s
sys     0m0.001s

```

```

@mx2753 → /workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-wf.so tests/MyTest2
Running test 2 to exercise malloc and free
Yay, test is good!!

heap management statistics
mallocs:      1027
frees:        514
reuses:       1
grows:        1026
splits:       1
coalesces:    2
blocks:       1025
requested:    1180672
max heap:     1139760

real    0m0.039s
user    0m0.013s
sys     0m0.000s

```

```

@mx2753 → /workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-nf.so tests/MyTest2
Running test 2 to exercise malloc and free
MyTest2: src/malloc.c:281: free: Assertion `CPoint->free == 0' failed.
Aborted (core dumped)

real    0m0.110s
user    0m0.003s
sys     0m0.001s

```

```

@mx2753 → /workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-ff.so tests/MyTest3
Running test 3 to test coalesce
Yay, test is good!!

heap management statistics
mallocs:      4
frees:        3
reuses:       1
grows:        3
splits:       1
coalesces:    2
blocks:       2
requested:    5472
max heap:     3496

real    0m0.006s
user    0m0.004s
sys     0m0.002s

```

```
@mxt2753 →/workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-bf.so tests/MyTest3
Running test 3 to test coalesce
Yay, test is good!!

heap management statistics
mallocs:      4
frees:        3
reuses:       1
grows:        3
splits:       1
coalesces:    2
blocks:       2
requested:    5472
max heap:     3496

real    0m0.005s
user    0m0.004s
sys     0m0.000s
```

```
@mxt2753 →/workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-nf.so tests/MyTest3
Running test 3 to test coalesce
MyTest3: src/malloc.c:281: free: Assertion 'CPoint->free == 0' failed.
Aborted (core dumped)

real    0m0.111s
user    0m0.004s
sys     0m0.001s
```

```
@mxt2753 →/workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-wf.so tests/MyTest3
Running test 3 to test coalesce
Yay, test is good!!

heap management statistics
mallocs:      4
frees:        3
reuses:       1
grows:        3
splits:       1
coalesces:    2
blocks:       2
requested:    5472
max heap:     3496

real    0m0.008s
user    0m0.000s
sys     0m0.008s
```

```
@mxt2753 →/workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-ff.so tests/MyTest4
Running test 4 to test a block split and reuse
address of Ptr1: 0x55b6fd88f430
address of Ptr2: 0x55b6fd88f430

heap management statistics
mallocs:      3
frees:        2
reuses:       1
grows:        2
splits:       1
coalesces:    1
blocks:       2
requested:    4096
max heap:     3120

real    0m0.008s
user    0m0.002s
sys     0m0.006s
```

```
@mxt2753 →/workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-bf.so tests/MyTest4
Running test 4 to test a block split and reuse
address of Ptr1: 0x563523225430
address of Ptr2: 0x563523225430

heap management statistics
mallocs:      3
frees:        2
reuses:       1
grows:        2
splits:       1
coalesces:    1
blocks:       2
requested:    4096
max heap:     3120

real    0m0.007s
user    0m0.005s
sys     0m0.001s
```

```

@mx2753 →/workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-nf.so tests/MyTest4
Running test 4 to test a block split and reuse
address of Ptr1: 0x55a1a04bf018
address of Ptr2: 0x55a1a04bf018

heap management statistics
mallocs:      3
frees:        2
reuses:       2
grows:        1
splits:       0
coalesces:    0
blocks:       1
requested:    4096
max heap:     1048

real    0m0.026s
user    0m0.005s
sys     0m0.004s

```

```

@mx2753 →/workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-wf.so tests/MyTest4
Running test 4 to test a block split and reuse
address of Ptr1: 0x56319d5a9430
address of Ptr2: 0x56319d5a9430

heap management statistics
mallocs:      3
frees:        2
reuses:       1
grows:        2
splits:       1
coalesces:    1
blocks:       2
requested:    4096
max heap:     3120

real    0m0.006s
user    0m0.001s
sys     0m0.005s

```

```

@mx2753 →/workspaces/malloc-mxt2753 (master) $ time tests/MyTest1
Running test 1 to test a simple malloc and free
Yay, test is good!!

real    0m0.004s
user    0m0.002s
sys     0m0.003s

```

```

@mx2753 →/workspaces/malloc-mxt2753 (master) $ time tests/MyTest2
Running test 2 to exercise malloc and free
Yay, test is good!!

real    0m0.006s
user    0m0.004s
sys     0m0.002s

```

```

@mx2753 →/workspaces/malloc-mxt2753 (master) $ time tests/MyTest3
Running test 3 to test coalesce
Yay, test is good!!

real    0m0.005s
user    0m0.004s
sys     0m0.000s

```

```

@mx2753 →/workspaces/malloc-mxt2753 (master) $ time tests/MyTest4
Running test 4 to test a block split and reuse
address of Ptr1: 0x562c8381e6b0
address of Ptr2: 0x562c8381e6b0

real    0m0.005s
user    0m0.004s
sys     0m0.000s

```

```
@mxt2753 →/workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-nf.so tests/MyTest2
Running test 2 to exercise malloc and free
Yay, test is good!!

heap management statistics
mallocs:      1027
frees:        514
reuses:       1026
grows:        1
splits:       0
coalesces:    0
blocks:       1
requested:    1180672
max heap:     1048

real    0m0.006s
user    0m0.003s
sys      0m0.001s
@mxt2753 →/workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-nf.so tests/MyTest3
Running test 3 to test coalesce
Yay, test is good!!

heap management statistics
mallocs:      4
frees:        3
reuses:       3
grows:        1
splits:       0
coalesces:    0
blocks:       1
requested:    5472
max heap:     1048

real    0m0.012s
user    0m0.003s
sys      0m0.004s
```

```
@mxt2753 →/workspaces/malloc-mxt2753 (master) $ time env LD_PRELOAD=lib/libmalloc-bf.so tests/MyTest3
Running test 3 to test coalesce
Yay, test is good!!

heap management statistics
mallocs:      4
frees:        3
reuses:       1
grows:        3
splits:       1
coalesces:    2
blocks:       2
requested:    5472
max heap:     3496

real    0m0.006s
user    0m0.005s
sys      0m0.001s
```

time env LD_PRELOAD=lib/libmalloc-_.so tests/MyTest r= real u=user s=system				
MyTest	bf	ff	nf	wf
1	r:014 u:003 s:003	r:008 u:005 s:000	r:008 u:005 s:000	r:005 u:003 s:002
2	r:011 u:010 s:001	r:001 u:007 s:004	r:006 u:003 s:001	r:039 u:013 s:000
3	r:006 u:005 s:001	r:006 u:004 s:002	r:012 u:003 s:004	r:008 u:000 s:008
4	r:007 u:005 s:001	r:008 u:002 s:006	r:026 u:005 s:004	r:006 u:002 s:003

Explanation and interpretation of the results including any anomalies in the test results.

Well, when I thought I finished my code. All of the sudden for “time env LD_PRELOAD=lib/libmalloc-nf.so tests/” for MyTest3, and MyTest4 wasn’t working for next fit or in nf. Then I commented out the problem code, and it all worked! Thus, I redid the nf screenshots as shown.

Conclusion

In conclusion, the timing with code space is pretty short considering if this was on a local machine it would actually run longer. I learned how to implement first fit, best fit, next fit, and worst fit. The hardest part was coalescing and the merging part of the assignment for me. The code `// assert(CPoint->free == 0);` //original gave me problems for the nf part of the assignment. However, when I commented it out, I finally worked the last information that I needed for next

fit. If my code doesn't work offhand then uncomment that part. Also, for some reason my code did not want to push. I decided to add file manually via github. In the end, this was a very difficult assignment that felt like there way only right way to do it, or else your code would fall apart. I think if I did malloc for my results it probably would've been faster.