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PA3 – Memory part B

Student Information

Integrity Policy: All university integrity and class syllabus policies have been followed. I have neither given, nor received, nor have I tolerated others' use of unauthorized aid.

I understand and followed these policies: ● Yes ○ No

Name:	Thang Tran
Date:	10/6/2018

Submission Details

Final ***Changelist*** number:	317797
Verified build:	● Yes ○ No
Number Tests Passed:	13
Required Configurations:	DEBUG & RELEASE

Discussion (What did you learn):

I learned how to initialize, allocate, and free memory in a more advanced level as well as deal with edge cases.

Verify Builds

- Follow the Piazza procedure on submission
  - Verify your submission compiles and works at the changelist number.
- Verify that only MINIMUM files are submitted
  - No – Generated files
    - *.pdb, *.suo, *.sdf, *.user, *.obj, *.exe, *.log, *.pdb, *.db
    - Anything that is generated by the compiler should not be included
  - No – Generated directories
    - /Debug, /Release, /Log, /ipch, /.vs
- Typical files project files that are required
  - *.sln, *.suo,
  - *.vcxproj, *.vcxproj.filters, *.vcxproj.user
  - *.cpp, *.h
  - CleanMe.bat

Standard Rules

Submit multiple times to Perforce

- Submit your work as you go to perforce several times (at least 5)
  - As soon as you get something working, submit to perforce
  - Have reasonable check-in comments
    - Points will be deducted if minimum is not reached

Write all programs in cross-platform C++

- Optimize for execution speed and robustness
- Working code doesn't mean full credit

Submission Report

- Fill out the submission Report
  - No report, no grade

Code and project needs to compile and run

- Make sure that your program compiles and runs
  - Warning level ALL …
  - NO Warnings or ERRORS
    - Your code should be squeaky clean.
  - Code needs to work "as-is".
    - No modifications to files or deleting files necessary to compile or run.
  - All your code must compile from perforce with no modifications.
    - Otherwise it's a 0, no exceptions

Project needs to run to completion

- If it crashes for any reason…
  - It will not be graded and you get a 0

No Containers

- NO STL allowed {Vector, Lists, Sets, etc...}
  - No automatic containers or arrays
  - You need to do this the old fashion way - ***YOU EARNED IT***

Leave Project Settings

- Do NOT change the project or warning level
  - Any changing of level or suppression of warnings is an integrity issue

Simple C++

- No modern C++
  - No Lambdas, Autos, templates, etc…
  - No Boost
- NO Streams
  - Used fopen, fread, fwrite…
- No code in MACROS
  - Code needs to be in cpp files to see and debug it easy
- ***Exception:***
  - implicit problem needs templates

Leaking Memory

- If the program leaks memory
  - There is a deduction of 20% of grade
- If a class creates an object using new/malloc
  - It is responsible for its deletion
- Any ***MEMORY*** dynamically allocated that isn't freed up is ***LEAKING***
  - Leaking is ***HORRIBLE***, so you lose points

No Debug code or files disabled

- Make sure the program is returned to the original state
  - If you added debug code, please return to original state
- If you disabled file, you need to re-enable the files
  - All files must be active to get credit.
  - Better to lose points for unit tests than to disable and lose all points

No Adding files to this project

- This project will work "as-is" do not add files…
- Grading system will overwrite project settings and will ignore any student's added files and will returned program to the original state

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Due Dates

- See Piazza for due date and time
- Submit program perforce in your student directory assignment supplied.
- Fill out your this ***Submission Report*** and commit to perforce
    - ***ONLY*** use Adobe Reader to fill out form, all others will be rejected.
    - Fill out the form and discussion for full credit.

Goals

- Learn
    - To Create a Memory System from scratch
- Understand the internals of a memory system

Assignments

1. Please ***VERIFY*** your builds for both ***DEBUG*** and ***RELEASE***

2. Create a memory system within a heap

- Take the given memory system framework for the heap layout:
    - Add the allocators
    - Add the de-allocators
- Run the Test functions that handles a set of memory allocation and de-allocations
    - *Supplied by Instructor*
    - ***Part B: tests 1-16 + stress test(17)***
        - Cut and paste your work from Part A into Part B
        - Continue developing
- Diagram the data structure layout out - to help you.

3. Take Memory system, use the stress test

- Measure the timing with default setting in the compiler
    - For the original memory system
    - For your custom memory system
- Measure the difference.
    - See in the Output windows
- Instructor will provide the stress tests
    - Make sure your program runs all unit tests 1-16
    - Make sure it runs the stress test – without crashing

4. *Grading*

a. Points:

- 17 Unit tests (last one is the stress test)
- 5 points for stress test
  - Working and performance time
- You cannot run the stress test UNLESS unit tests 1-17 are working.
  - 3 pts for Unit test 16
    - (Checking coalescing on adjacent free blocks - no looping)
- Points
  - 17 pts – unit tests
  - 3 pts – unit test 16 - adjacent free blocks… no looping
  - 5 pts – stress test
  - total: 25 pts

Validation

Simple checklist to make sure that everything is submitted correctly

- Is the project compiling and running without any errors or warnings?
- Does the project run ***ALL*** the unit tests execute without crashing?
- Is the submission report filled in and submitted to perforce?
- Follow the verification process for perforce
  - Is all the code there and compiles "as-is"?
  - No extra files
- Is the project leaking memory?

Hints

Most assignments will have hints in a section like this.

- Do many little check-ins
  - Iteration is easy and it helps.
  - Perforce is good at it.
- Look at the lecture notes!
  - A lot of good ideas in there.
  - The code in the examples work.
- Use the Piazza
  - This is much harder than the last assignment.
  - See me during office hours.
  - Read, explore, ask questions in class

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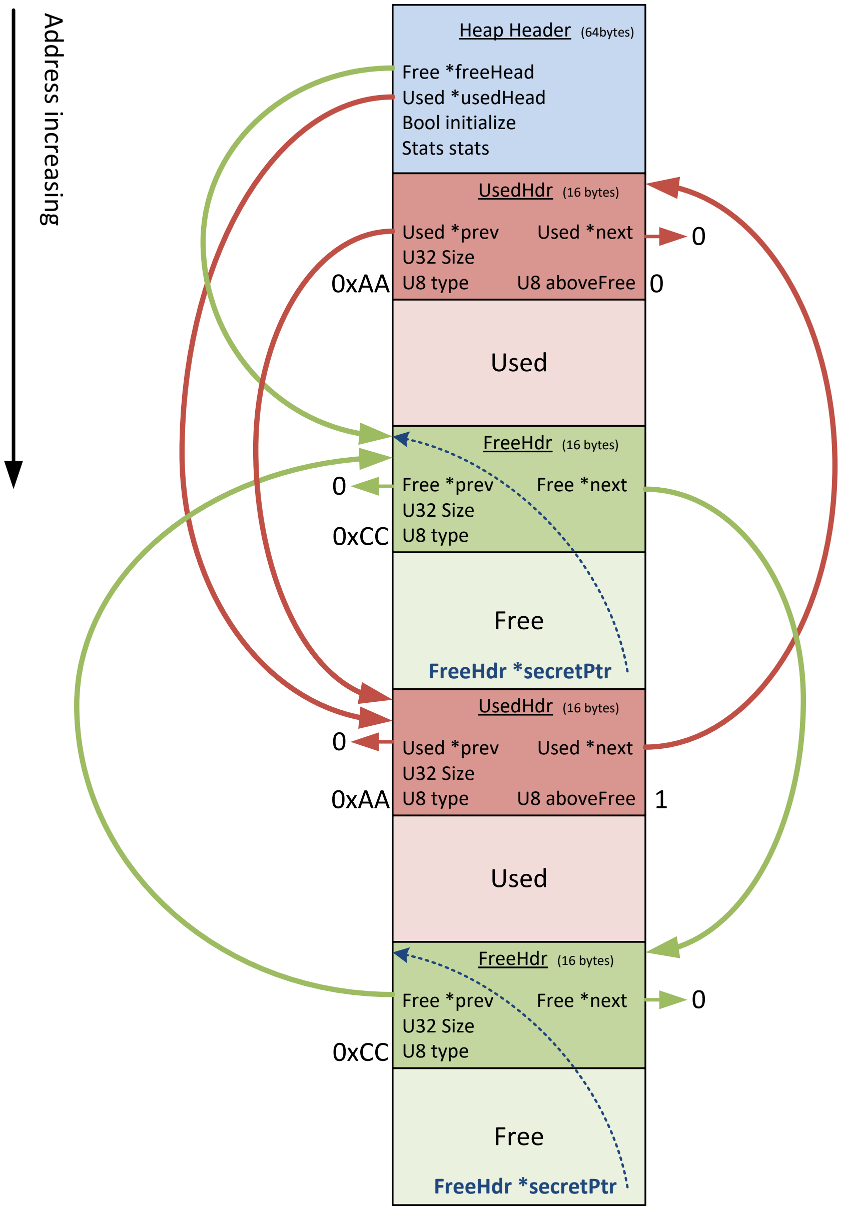
Memory system diagram:



Notes:

* Used blocks are unsorted, pushed to the head

* Free blocks are sorted smallest address at the front of list

* Used block size, Free block size does not include the header size

* Minimum allocation is multiple of 16 bytes

* Heap is aligned on creation, no need to align the heap after it has been initialized

* Two adjacent free blocks are coalesced into one large free block

* secretPtr is place at the bottom 32 bits of the free block, it points back to the freeHdr

* types – 0xAA used, 0xCC free