CS 1632 - DELIVERABLE 4: Performance Testing

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https://github.com/iamjaypatel/D4

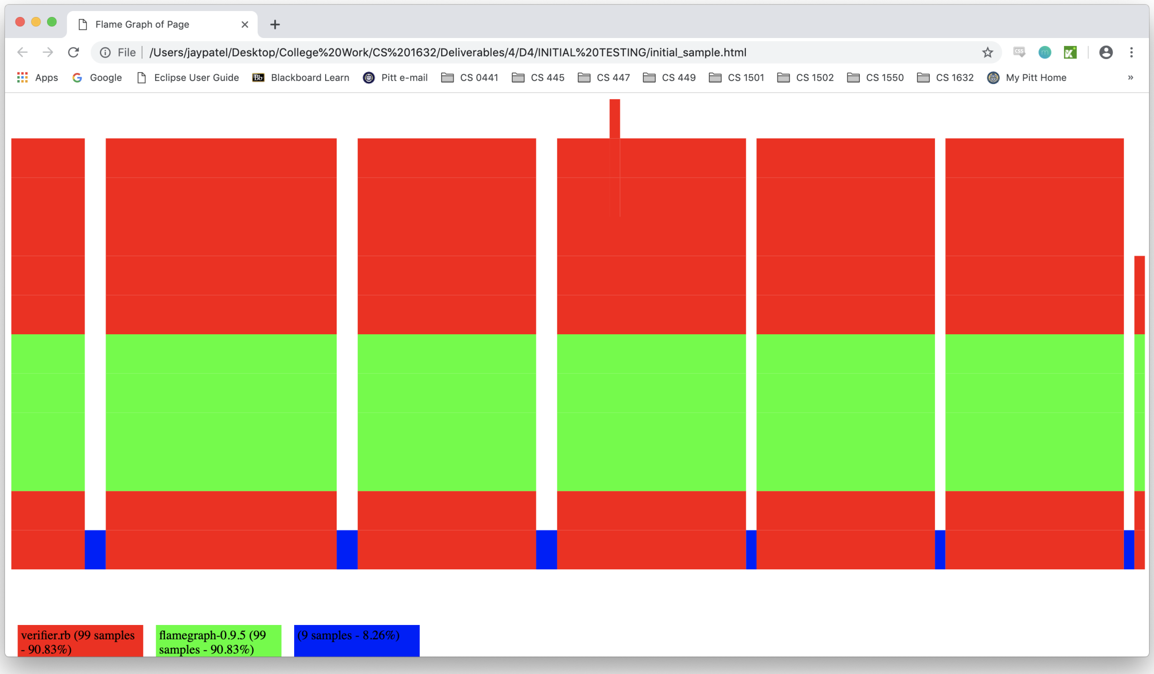
Extra Credit:
+1 ISSUE #35
+1 ISSUE #40

Summary

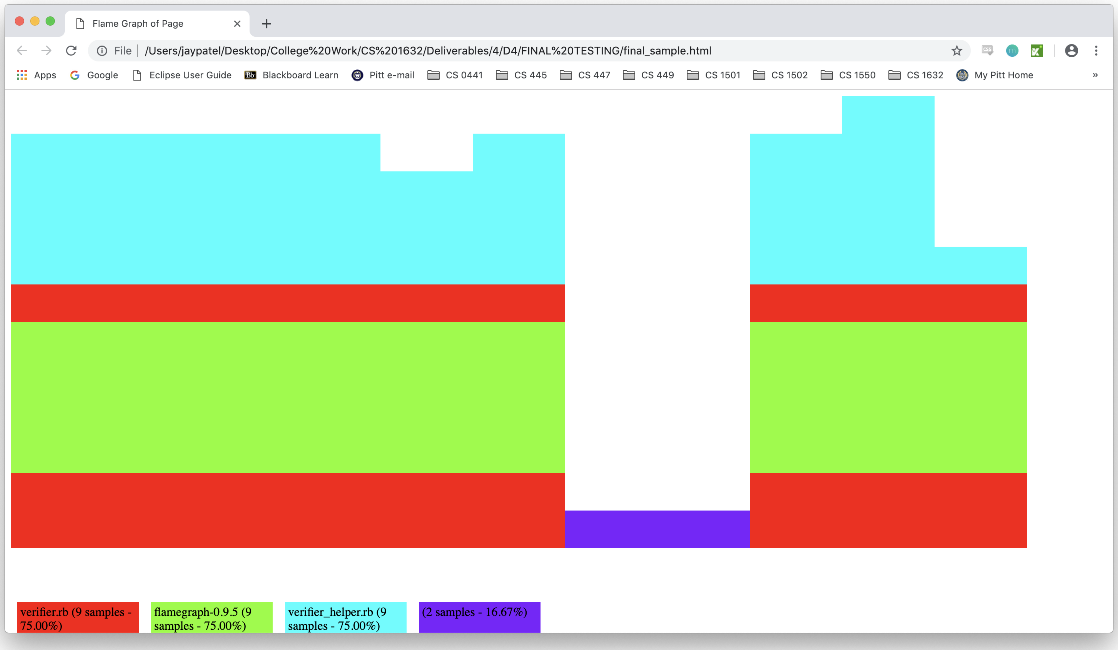
The most challenging aspect of this deliverable was being able to optimize the code while keeping it testable. We were tempted oftentimes to experiment with Ruby libraries, such as Threads, to optimize the code. However, we found such an approach makes writing test cases considerably harder, so we had to resign ourselves to this tradeoff. Some edge cases and failure modes considered include passing in a file that does not exist, having an invalid block in the file, having incorrect transactions in the block (such as a random string), or attempting to send an invalid amount of billcoins (non-numeric characters). Since much of the program relied more on reading a file rather than user inputs, there were far more failure modes than edge cases considered, as much of the edge cases were not as testable (such as a user passing in very large file). The flame graph showed that our calc_hash function was taking up the vast majority of the CPU time, followed by the File read loop. Based on this data, we optimized calc_hash by utilizing memoization, where previous calculations are stored in a hash rather than recalculated, which resulted in redundancy. While calc_hash is still at the top of the flamegraph, it has been considerably optimized compared to the initial approach. Overall, calc_hash was the main performance bottleneck, and the memoization approach hugely decreased the method’s CPU time and thus the runtime of our verifier as a whole.

Flamegraphs of sample.txt

- Before enhancement(Initial Testing)


Flame Graph of Page
/Users/jaypatel/Desktop/College%20Work/CS%201632/Deliverables/4/D4/INITIAL%20TESTING/initial_sample.html
Apps
Google
Eclipse User Guide
Blackboard Learn
Pitt e-mail
CS 0441
CS 445
CS 447
CS 449
CS 1501
CS 1502
CS 1550
CS 1632
My Pitt Home
verifier.rb (99 samples - 90.83%)
flamegraph-0.9.5 (99 samples - 90.83%)
(9 samples - 8.26%)

- After enhancement(Final Testing)


Flame Graph of Page
/Users/jaypatel/Desktop/College%20Work/CS%201632/Deliverables/4/D4/FINAL%20TESTING/final_sample.html
Apps
Google
Eclipse User Guide
Blackboard Learn
Pitt e-mail
CS 0441
CS 445
CS 447
CS 449
CS 1501
CS 1502
CS 1550
CS 1632
My Pitt Home
verifier.rb (9 samples - 75.00%)
flamegraph-0.9.5 (9 samples - 75.00%)
verifier_helper.rb (9 samples - 75.00%)
(2 samples - 16.67%)

Note: .html file in repository under INITIAL TESTING and FINAL TESTING folder.

Times for long.txt

- Before enhancement(Initial Testing)

  - Mean: 1m7.531s
  - Median: 1m7.932s

Real	User	Sys
1m5.982s	1m3.897s	0m1.237s
1m7.932s	1m5.567s	0m1.327s
1m8.680s	1m5.830s	0m1.504s

- After enhancement(Final Testing)

  - Mean: 0m2.231s
  - Median: 0m2.229s

Real	User	Sys
0m2.223s	0m2.031s	0m0.159s
0m2.229s	0m2.037s	0m0.157s
0m2.241s	0m2.042s	0m0.165s