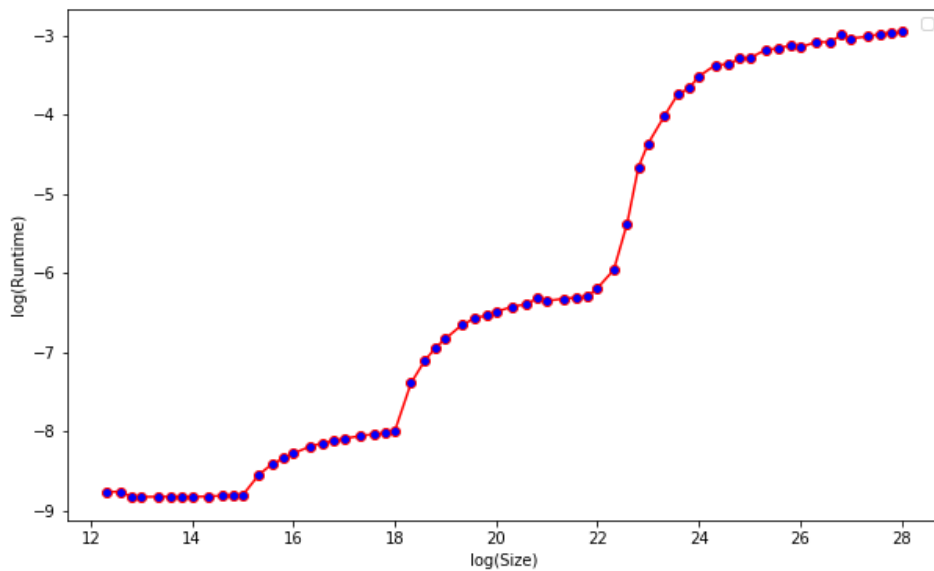


Cache Analysis Lab Homework

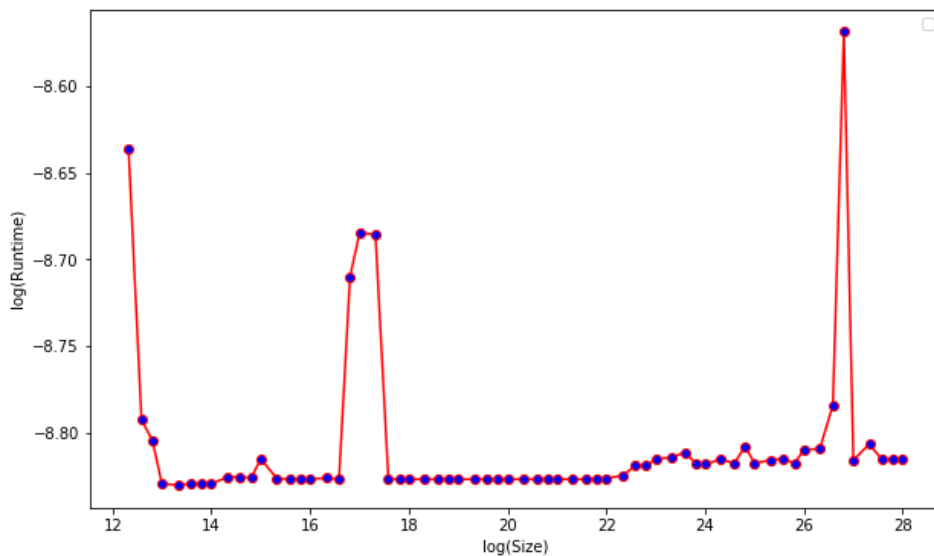
netId: hd25

1. Two Labeled plots, one for each of these cases.

- Shuffle on:



- Shuffle off:



2. Where did you run your code? Do you know any memory configuration of this computer?

My MacBook Pro 2018.

L1 cache size: 32768 Bytes = 32KB

L2 cache size: 262144 Bytes = 256KB

L3 cache size: 6291456 Bytes = 6MB.

3. Do you think stride prefetching is being done on your architecture? Why or why not?

When shuffle on, there is no stride prefetching. Because from the shuffle-on plots, we can see the run time is gradually increasing, there is no stride prefetching.

When shuffle off, there is stride prefetching being done. From the shuffle-off plots, we can see the run time is almost constant (subtle variations) so there is stride prefetching to prefetch data from memory.

4. What factors could be influencing the quality of your measurements?

- Too many background processes.

There might be too many background processes in my computer which will occupy part of the cache, therefore influencing the measurement result.

- Equipment aging.

The computer may be used for a long time then causing the degradation of performance.

- Interruption mechanism

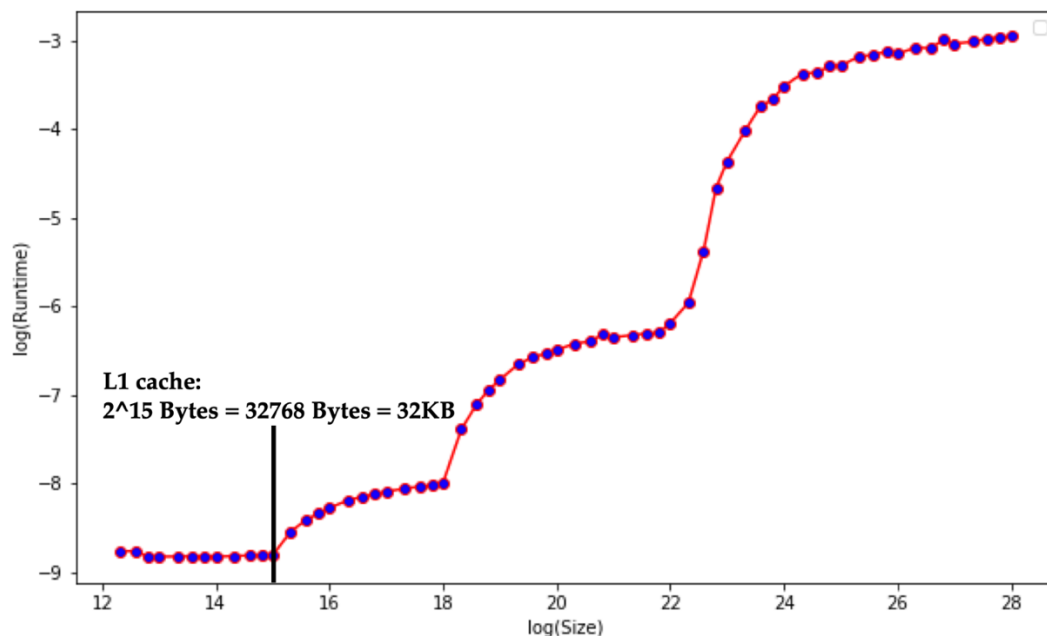
The process might be interrupted by the interruption mechanism to execute another one, increasing the execution time and the result.

5. What steps could you use to improve the quality of your measurements?

According to question 4, I suppose I can do the following things to improve the result:

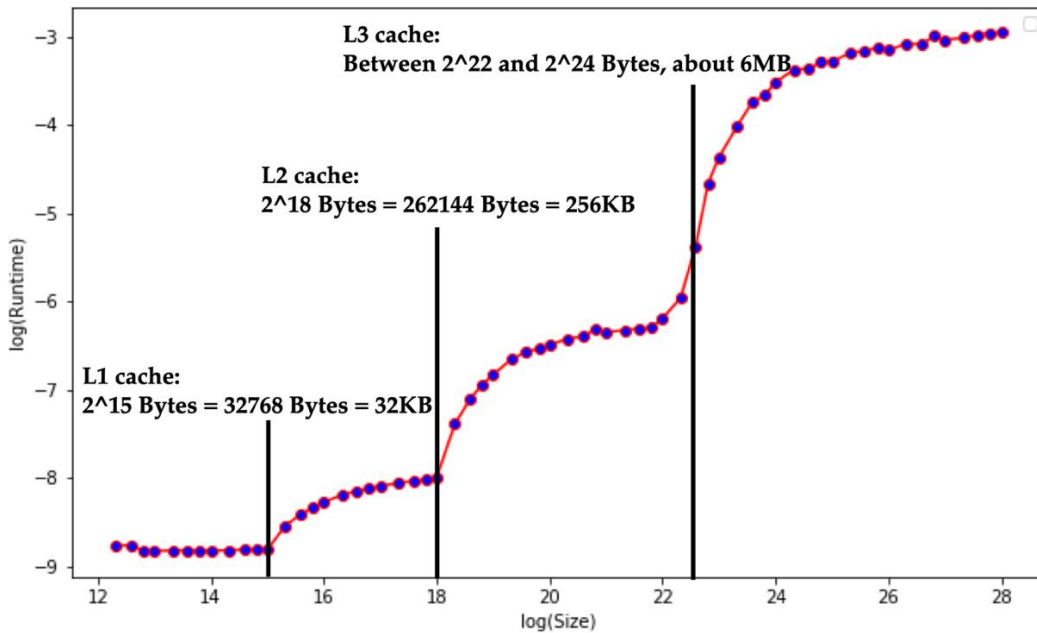
- Reduce the number of processes executed in the background to free the space of cache.
- Update the equipment of computer to improve its performance.
- No interrupting during program running time to eliminate the extra running time, therefore optimizing our result.

6. Estimate the L1 cache size. Label this point on your two plots.

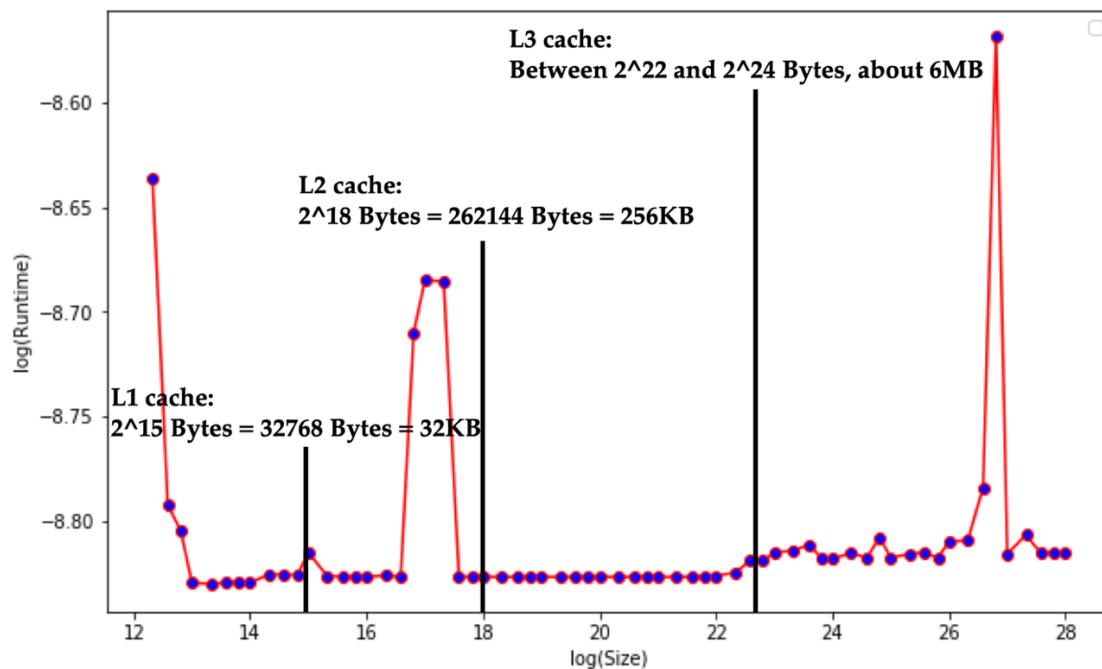


7. How many levels of memory hierarchy do you detect? Explain and label these on your two plots.

- Shuffle on



- Shuffle off



8. Estimate the memory bandwidth you are seeing in the L1 part of the curve.

$$32768 / 1024 / 1024 / 0.00223184 = 14.001899777761 \text{ Mb/s.}$$