

Lab Report

ECPE 170 – Computer Systems and Networks – Spring 2016

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Lab Topic: Performance Optimization (Lab #: 06)

Question #1:

What is the total physical RAM installed in the system? (In MB).

Answer:

The total physical RAM in megabytes is 4000 MB or 4GB.

Question #2:

With no applications running (beyond the web browser with this page), how much RAM is used by the native operating system? (e.g. Windows)

Answer:

2.0 GB or 2000 MB is currently in use by the native operating system, Windows, with just the web browser open.

Question #3:

With no applications running (beyond the web browser with this page), how much RAM is available?

Answer:

1.9 GB or 1900 MB of RAM is available with no applications running beyond the web browser.

Question #4:

Check the virtual machine configuration. How much RAM is currently allocated to Linux in your virtual machine?

Note: Your answer to question 4 must be less than your answer to question 3! Otherwise, your system will use slow virtual memory (i.e. swapping data to the hard disk) when running this lab.

Answer:

2 GB or 2000 MB of RAM is currently allocated to Linux in my virtual machine. This is the amount of RAM I've been using for all the labs this semester.

Question #5:

Try to increase your virtual machine memory allocation, if possible, to the maximum allowed based on your free RAM. Leave ~256MB free for the virtual machine program itself. Now how much RAM is allocated to Linux in your virtual machine?

Answer:

59.7 GB is allocated to the virtual machine after I increase the virtual machine memory to the max in the virtual box settings.

Question #6:

Boot Linux. With no applications running in Linux, how much RAM is available inside the virtual machine? The "System Monitor" program should report that information. This is the space that is actually available for our test application.

Answer:

747.4 MB is being used out of a total 1.9 GB or 1900 MB of Ram available inside the virtual machine.

Question #7:

What is the code doing? (Describe the algorithm in a paragraph, focusing on the `combine1()` function.)

Answer:

The code is moving the data stored in `vec_ptr v`. The data is then stored in a temporary `data_t` val variable. It's finally copying the value to `data_t *dest`. The for loop executes this process for the size of the array specified when the user runs the program. The `data_t` is a struct that can be changed using the `config.h` header file. The time it takes to run the loop is also recorded by the program and the amount of memory used.

Question #8:

What is the largest number of elements that the vector can hold WITHOUT using swap storage (virtual memory), and how much memory does it take? Be sure to leave enough memory for Firefox and LibreOffice, since you'll need those when running this lab as well.

Answer:

The largest number of elements that the vector can hold without using swap storage on my system is 999000000 elements.

Question #9:

What vector size are you using for all experiments in this lab?

Answer:

I am using a vector size of 300000000 for all of the experiments in this lab.

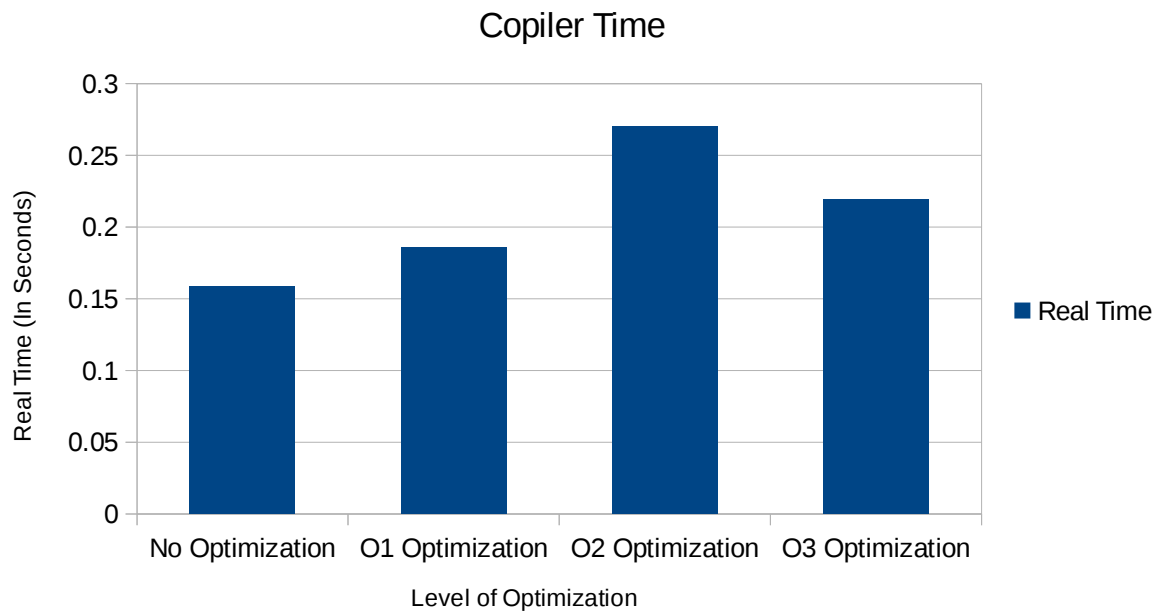
Question #10:

How much time does the compiler take to finish with (a) no optimization, (b) with -O1 optimization, (c) with -O2 optimization, and (d) with -O3 optimization? Report the Real time, which is the "wall clock" time. Create both a table and a graph in LibreOffice Calc.

-No Optimization

Answer:

Level of Optimization	Real Time (In Seconds)
No Optimization	0m0.159s
O1 Optimization	0m0.186s
O2 Optimization	0m0.270s
O3 Optimization	0m0.219s



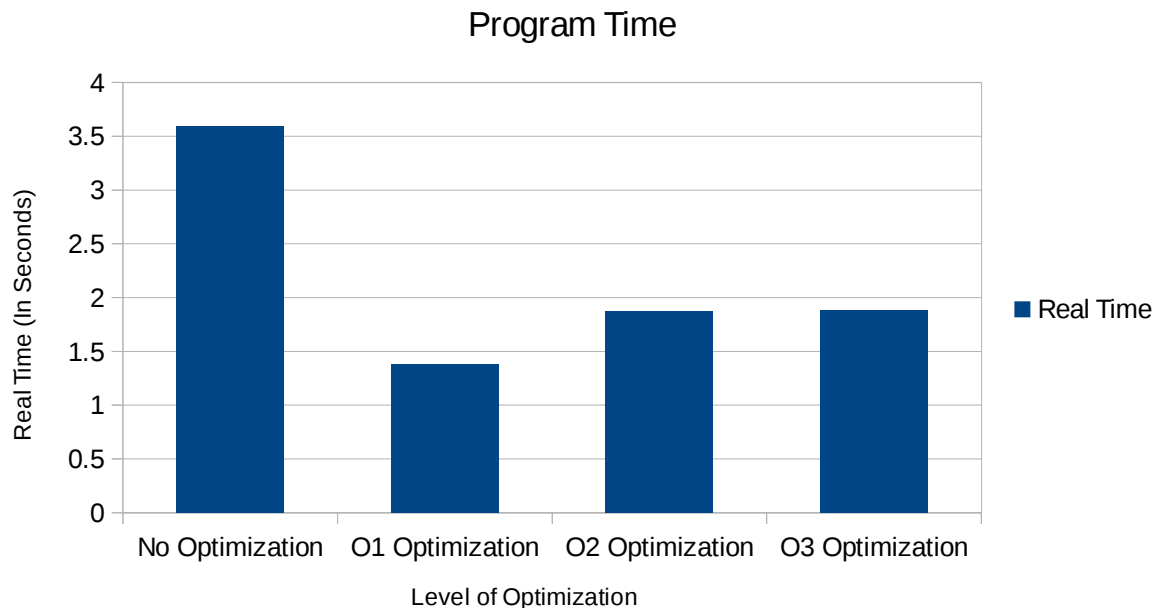
Question #11:

How much time does the program take to finish with (a) no optimization, (b) with -O1 optimization, (c) with -O2 optimization, and (d) with -O3 optimization? Report the Real time, which is the "wall clock" time. Create both a table and a graph in LibreOffice Calc.

-No Optimization

Answer:

Level of Optimization	Real Time (In Seconds)
No Optimization	0m3.594s
O1 Optimization	0m1.375s
O2 Optimization	0m1.873s
O3 Optimization	0m1.885s



Question #12

After implementing each function, benchmark it for a variety of data types and mathematical operations. Fill in the table below as you write each function.

Answer:

Configuration	Vector Size (Elements)	Vector Size (MB)	Time for Integer Add	Time for Integer Multiply	Time for FP (Float) Add	Time for FP (Float) Multiply
combine1()	300000000	1144.41	1.096	1.037	1.333	1.295
combine2()	300000000	1144.41	0.879	1.064	1.032	1.243
combine3()	300000000	1144.41	0.848	0.882	1.017	1.022
combine4()	300000000	1144.41	0.208	0.216	0.375	0.365
combine5x2()	300000000	1144.41	0.162	0.061	0.368	0.56
combine5x3()	300000000	1144.41	0.164	0.048	0.371	0.587
combine6()	300000000	1144.41	0.178	0.06	0.251	0.328

Question #13

Using LibreOffice Calc, create a *single* graph that shows the data in the table created, specifically the four time columns. (You don't need to plot vector size)

Answer:

