**General:** In this assignment, you will become acquainted with hardware and software support for parallel processing built on top of microprocessor architectures. You will be asked to observe and research areas. Provide your written response in an MS Word document.

**Part I - Hardware:**

In our Unix/Windows lab, we have Intel I7 processors. Go to any workstation and start up Powershell. Then at the command line enter the following:

Get-WmiObject –class Win32\_processor | select \*

The Get-WmiObject command in Powershell allows you access to information available through the Windows Management (WMI) Instrumentation infrastructure. WMI supports web-based administration of MS Windows workstations (more information is at <https://msdn.microsoft.com/en-us/library/aa384642%28v=vs.85%29.aspx> ) This example of Get-WmiObject provides information about the model of the processor on your work station.

**Research Requirement:** Examine the output of the command above. Then, determine how many physical processors are available. Then examine how many “logical” processors are available. Note your observations in the response document you are preparing. Take time to note other attributes about the processor such as clock speed, power management, cache etc. (if you’re not sure about cache memory, you can read about it at <http://searchstorage.techtarget.com/definition/cache-memory> ) Now that you have had a first-hand look at what’s under the cover, take time to search the web for pricing information on this model of processor. Then, find a comparable processor (i.e. same number of cores) from another vendor such as AMD. In your response, describe why you believe one is a better bargain than the other.

**Research Requirement:**  On the third floor of the Science Building, go to room SB381. To the left of its door is a poster about the Beowulf cluster in that room. Take time to read the information about the cluster. Discuss a business problem you believe would benefit from the cluster.

**Part II – Software Observation**

You are provided a Visual Studio Solution named “with-without” It reads in a large file and processes the data within twice – once with a single thread and “once” taking advantage of multiple cores. Using the file named “bigfile.txt” do the following:

1. Review the method baseProcess in the class fileAverage to determine what it does with each line (string). Describe what that code is doing in your document.
2. Review the code to determine where the data is read in from the file. Then find the code that processes that data using a single thread and then were it uses the **For** method in the .Net Parallel class.
3. Create a spreadsheet with the heading “Run Time Comparisons.” Beneath that it should have the following columns: Number of Runs, Single Processor, Multi Processor
4. Run the application. You only need to identify the location of “bigfile.txt” once. Then set the number of times to run at 1. Do the same thing two more times (that is, leave the number of times to run set to 1). Calculate the average of the three trials for both the Single Processor time and the Multi-Processor time. Note the average durations in the spreadsheet. Do this again for 2 runs, then 4, 10, 20, 50 and 100.
5. In Excel create a chart of the run times and paste that into your document. There should be a line for the single threaded times and one for the times using parallel processing. An example is below:
6. Upon completion respond to the following:
   1. If you did this in the lab, note that you did so. If you did not do this in the lab, how many cores were on the machine you used and did it use hyper-threading?
   2. How much of an improvement in run time is there between single and multiprocessor.
   3. What aspect of the program would not benefit from parallel processing?
   4. During each set of three trial runs, you may have noticed a difference in times even though the number of runs was the same. Did it seem to go faster after the very first run? What do you think might account for any large variations?