| Algorithmics | Student information | Date | Number of session |
|---|---|---|---|
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# Activity 1. [Power of the CPUs]

**Task 1.**

- **CPU:** Intel Core I7 4770K @ 4.0 GHz.
- **RAM:** 2x 8 GB Kingston Hyper X DDR3 1600 MHz == 16 GB.
- **Average index of integer operations:** 109.
- **Time to execute Benchmarking1:** 210.
- **Average index of integer operations by Benchmarking1:** $210 \cdot 109 = 22{,}890$

**Task 2.**

| # | CPU | milliseconds | SC Mix (avg.) | Operations (aprox.) |
|---|---|---|---|---|
| 1. | i7-4770K | 210 | 109 | 22,890 |
| 2. | Ryzen 5 3500U | 235 | 82.8 | 19,458 |
| 3. | Ryzen 5 3600X | 78 | 134 | 10,452 |

*Table 1 - Measures of different CPUs*

**Conclusion.**

- **Do you think you could mix values from different CPUs in the same analytical study of the execution times of an algorithm?** I do not think so, if you want to analyze different values from different studies of the same algorithm, in order them to be comparable, the only variable that can change must be the one you want to study. I mean, if you want to study how different systems perform against the same algorithm: for sure, use different CPUs, but notice, this time it will happen the whole same thing, you may change the CPU, but the RAM, as the results may have changed not only because the CPU is better – or worse – but also because you have used another memory. However, what we want to study is the execution times of an algorithm, so we may preserve all the variables involved as constant as possible for the result to be conclusive. Let's put an example for this to be clearer: imagine you want to analyze how an algorithm performs given different inputs, if you not only

vary such inputs, but also modify the frequencies of the CPU, how can you tell if the difference on the results is caused by the fact that the value of the inputs is changing or by the several frequencies that are being used. You just can't, the new results may be influenced by one variable, the other, or both at the same time.

## Activity 2. [Influence of the operating system]

**Task 1. (Always at idle)**

- **CPU freq. with High Performance plan:** 3.89 GHZ.
- **CPU freq. with Balanced plan:** 1.12 GHZ.
- **CPU freq. with Economizer plan:** 0.77 GHZ.

**Task 2. (Notice that the CPU is still: i7 4770K)**

| Energy Plan | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High Performance | 208 | 207 | 207 | 207 | 207 | 207 | 207 | 208 | 208 | 207 | 207 | 208 | 208 | 207 | 208 |
| Balanced | 210 | 209 | 210 | 209 | 211 | 210 | 210 | 210 | 210 | 238 | 210 | 210 | 210 | 208 | 209 |
| Economizer | 956 | 961 | 988 | 1020 | 874 | 903 | 915 | 919 | 892 | 968 | 920 | 856 | 864 | 841 | 989 |

*Table 2 - Comparison of the execution of a program with different power plans. All the measures are in milliseconds.*

| Execution | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sequential | 208 | 207 | 207 | 207 | 207 | 207 | 207 | 208 | 208 | 207 | 207 | 208 | 208 | 207 | 208 |
| Parallel | 332 | 311 | 310 | 319 | 322 | 319 | 319 | 313 | 315 | 311 | 342 | 315 | 323 | 310 | 297 |

*Table 3 - Comparison of the execution of a program in parallel. Power plan is the same for both: High-Performance.*

**Conclusion.**

- **Which energy plan do you think is the most appropriate for making measurements?** It could range from high performance to balanced, even if *high performance* will be the best. As economizer will prevent the CPU from consuming too much energy, not allowing us to get the whole potential of the system. On the other hand, high performance will just set the speed to the maximum possible of the processor, and balanced will adapt it depending on the usage.

- **If you had to perform a very long experiment, could you use the computer to, for example, watch a YouTube video in the meantime?** Never, as the experiment's

results would not be conclusive, we would have put another variable to it. As explained before on the *conclusion of the Activity 1*.

- **Do you think it is convenient to make several measurements simultaneously on the same computer?** Neither do I, because the resources used for each process may not be even, what's more, the fact of executing several tasks at the same time will cause the process not to be able to use as much resources as they probably need.