General Hints for the EASY Exercises

- Assignments must be worked on in groups of two students. Both, the approach and the solution must be developed together. Single submissions are not accepted.
- Every group is provided with a Gitlab repository, where the submissions can be managed (`https://gitlab.cs.fau.de/easy-exercises/ws18/<GROUP>`). Submissions are marked with a special tag in Git (`submissionX`). Please place the submission in a directory named `assignmentX`, where `X` stands for the current assignment number.
- Every student is provided a project dir under `/proj/i4easy/<login>`. This project dir can be used for work-in-progress or a checkout of the repository.
- After the deadline each group presents their submission to a tutor in the computer exercise.
- Further information can be found on the lecture website: `https://www4.cs.fau.de/Lehre/WS18/V_EASY`.

EASY-Assignment #1: Energy Measurement

We provide a program, `julia`, which computes a graphical representation of a julia set[1]. For this exercise, we can completely ignore the mathematical background. Instead, we evaluate this computation for its energy demand.

Goals of this assignment

- Measure the energy demand of a software function
- Discuss measurement accuracy and precision
- Understand the basics of energy profiling

1.1 Performance-counter based energy estimation

Many modern CPUs provide a hardware interface to monitor their energy demand. Our target platforms `faui49easy{01,02,03}` offer the `RAPL` interface. Use it to measure the energy demand of the `julia` program. Repeat the measurement for a suitable number of times. Compute average, median, and quartiles of the energy demand. Can you observe any trend between measurement runs?

1.2 Physical energy measurement

All `faui49easy{01,02,03}` machines are connected to a physical 230V power monitoring device. Use it to measure the energy demand at whole-system level. Compare the results to the `RAPL`-based evaluation.

1.3 Measurement precision

Create a program (`NOP`) that immediately calls `exit`. Again, measure its energy demand (use both `RAPL` and the 230V measurement methods). What results can you observe?

1.4 Idle power demand

Measure the power demand of the system in idle state. You can re-use your scripts if you write a program that calls `sleep` to spend a configurable amount of time in the idle state (but keep in mind that background processes can still be active). How does the sleep time affect the measured energy consumption? Also compare the results to the power demand while executing the `julia` program. Do the two energy measurement methods provide the same results?

1.5 Energy profiling

Execute further experiments where the output of `julia` is either written to a standard file, or to `/dev/null`. What information can you derive?

Notes

- Supplied material: The `julia` program (`/proj/i4easy/pub`)
- You should write scripts to make your experiments reproducible
- The driver for the power monitoring device can be found in `/proj/i4easy/pub`
- Deadline: 2018-11-26 12:00

[1] `https://en.wikipedia.org/wiki/Julia_set`