20875 Software Engineering – In-class assignment

Friday, November 6th, 2026

You are given a C program that is passed a single argument: the path to a file. It reads that file as a series of signed 16-bit integers (two's complement, little endian). It discards all elements that are zero or negative. For every positive element c, it outputs $\lfloor 32767/c \rfloor$ as a signed 16-bit integer (two's complement, little endian), in the same order as the input.

Write a multithreaded version of this code.

Details:

- Reference single-threaded implementation: `divide_m0.c`.
- Tests will be run on a computer with 12 cores. Input will be a large file with signed 16-bit integers following a uniform random distribution. You can assume that the file has an even size and will be fully cached in memory. You can also assume that opening, reading, and writing files succeed.
- Your code will be compiled as follows:

  ```
  cc -Wall -O3 -std=c23 -ggdb -o divide_m1 divide_m1.c -lpthread
  ```

- This is an individual assignment. Collaboration is not allowed.
- Track 1: Use of LLMs and the internet is allowed. Full marks: the code is correct and has at least 3× speedup over the reference code. Bonus mark: the code has at least 6.1× speedup over the reference code.
- Track 2: Use of LLMs is not allowed. Use of the internet is allowed. Full marks: the code is correct. Bonus mark: the code has at least 1.1× speedup over the reference code.