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High-performance Thread-safe IO

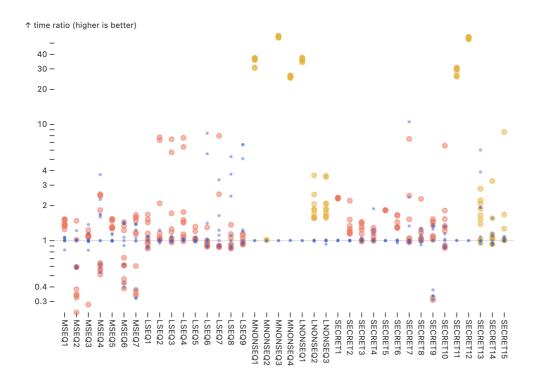
This is a high-performance C++ implementation of IO functions like read and write using memory-mapping and (occasionally) caching. Implementations are thread-safe and substantially faster than stdio counterparts. Main features include:

- io61_read: equivalent of fread;
- io61_write: equivalent of fwrite;
- io61_seek: equivalent of fseek.

Performance Summary

The below statistics were obtained via testing on a Linux system.

- Averages 3-5x stdio performance overall.
- Up to 40-50x performance boost over stdio on non-sequential read/write patterns (e.g., strided).
- Matches or beats average stdio performance on sequential reads and writes.



Multithreading

Multithreading support was added via fine-grained file range locks. Threads that fail to grab the lock block instead of poll (i.e., busy-waiting) to avoid unnecessary consumption of CPU resources.

Other Details

The C++ implementations of read and write (along with the rest of the IO functions) can be found in io61.cc. There are two versions:

• the io61.cc in the folder Performance Version does not support multithreading;

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• the io61.cc in the folder Thread-safe Version is a superset of the eponymous file in Performance Version; the only difference is that it is also thread-safe.

Both performance and thread-safety tests can be run by typing make run in the terminal.