

# 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;

- 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.