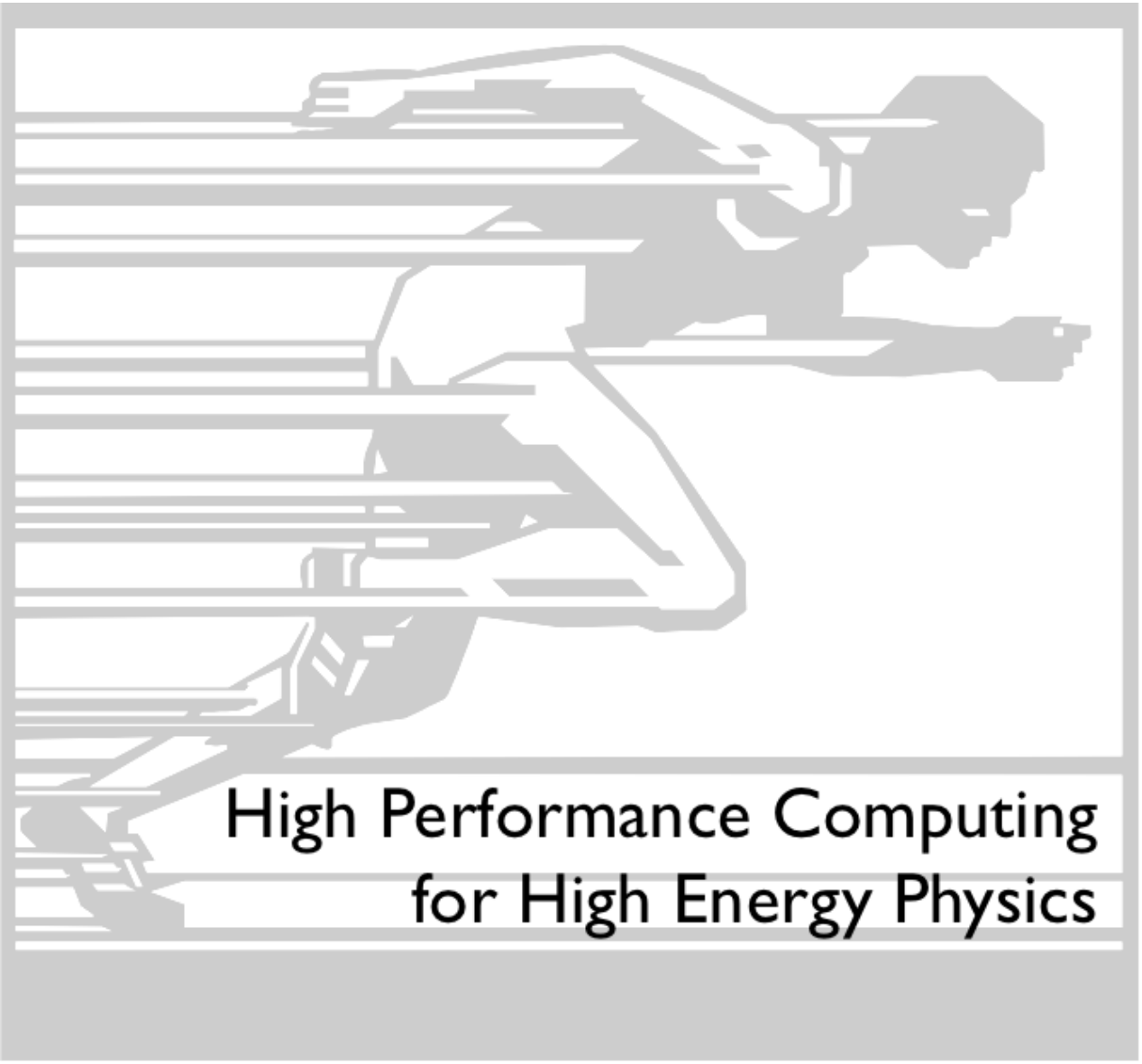
Yet another Malloc Profiler (this time based on std::stacktrace)



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CMS Experiment

Motivations

- Replace igprof (unmaintained)
- Do not use external libraries (they need to be updated)
- Keep code simple (easy maintenance)
- Keep output format easy (and possibly human readable)
- Use existing tools for analysis and display

std::backtrace

- In C++23 standard
- "supported in gcc" since v12
- Need compiler to be specifically configured
  - --enable-libstdcxx-backtrace=yes
- Tool need to be linked with a static library
  - -lstdc++_libbacktrace in gcc12, -lstdc++exp in gcc14
- Three bugs found: two fixed in the main branches
  - Third trivial (affect only stacktrace header file)

112348	gcc	libstdc+	unassigned@gcc.gnu.org	UNCO	---	[C++23] defect in struct hash<basic_stacktrace<_Allocator>>
112263	gcc	libbackt	unassigned@gcc.gnu.org	RESO	FIXE	[C++23] std::stacktrace does not identify symbols in shared library
111936	gcc	libstdc+	redi@gcc.gnu.org	RESO	FIXE	std::stacktrace cannot be used in a shared library

Resources:
https://stackoverflow.com/questions/3899870/how-to-print-a-stack-trace-whenever-a-certain-function-is-called/54365144

Instrumentation

- As everybody else does
  - LD_PRELOAD
  - dlsym(RTLD_NEXT, "malloc"); etc
  - std::stacktrace objects kept in an unordered_map
    - One could try to use a Patricia Trie
  - Accumulation by thread (ncalls, memtot, memlive, max-memlive)
  - Final aggregation and symbol-name resolution at dump time
  - In process (dump-time) and post processing filtering and “remangling”
- Result is a file containing ;-separated-stacktraces with a value associated

- https://github.com/VinInn/MallocProfiler/tree/main

Visualization tools

- FlameGraph
  - https://www.brendangregg.com/flamegraphs.html
  - https://github.com/brendangregg/FlameGraph
  - FlameGraph/flamegraph.pl --width 2400 step3_DumpDoEvent.md > /tmp/step3_DumpDoEvent.svg
- Speedscope (thanks to Giulio Eulisse for pointing it out)
  - https://github.com/jlfwong/speedscope
  - Just open the web-app and drop the file
- Just try
  - scp lxplus8.cern.ch:/afs/cern.ch/user/i/innocent/public/step3_DumpDoEvent.md .

caveats

Remangling

Filtering

Current status and future developments