Optimizing std::sort in libc++

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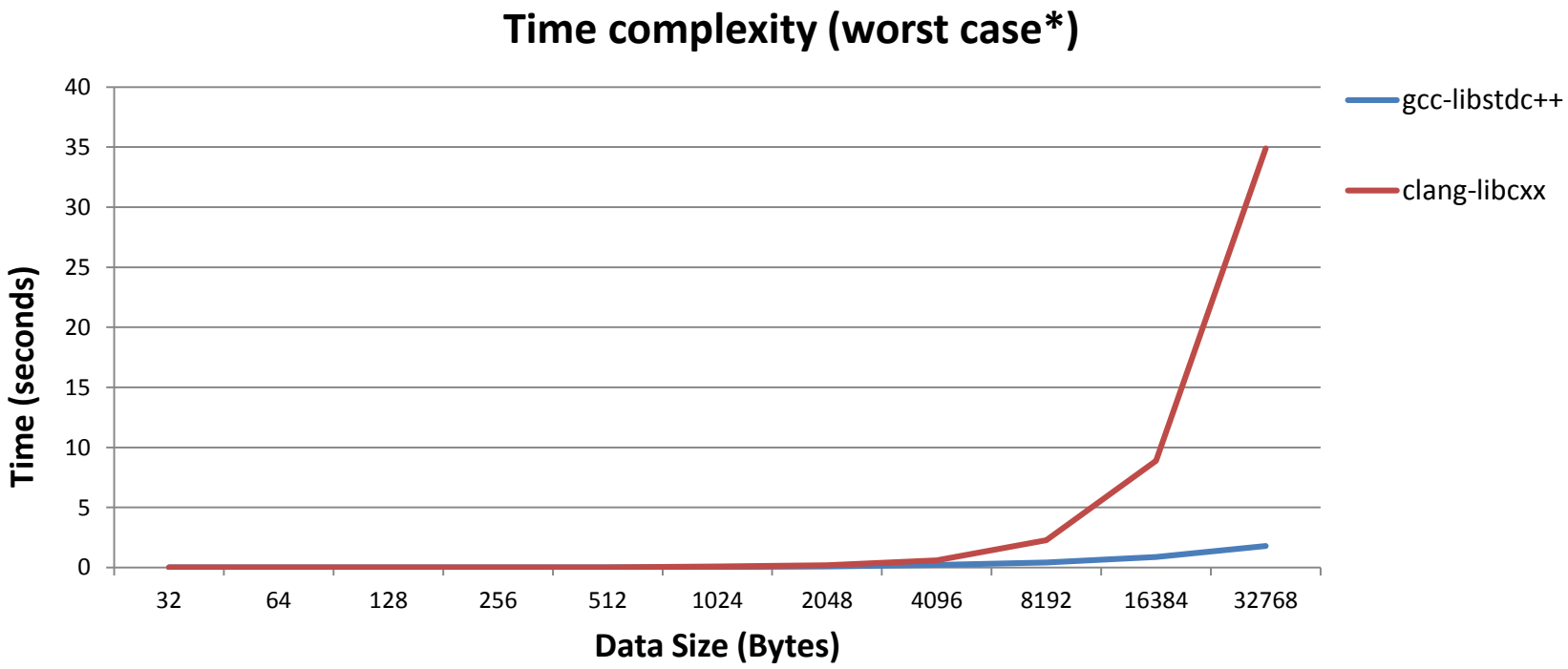
Issues with std::sort (libc++)

- Worst case
  - clang-libc++ O(N^2) vs. gcc-libstdc++ O(NlogN)



* https://bugs.llvm.org/show_bug.cgi?id=20837

Sorting Algorithm in libc++

- Sorting algorithm currently implemented in libc++ uses quicksort
- Worst Case Complexity – O(N^2)
- Recursion Stack Space – O(logN)

Modifications done

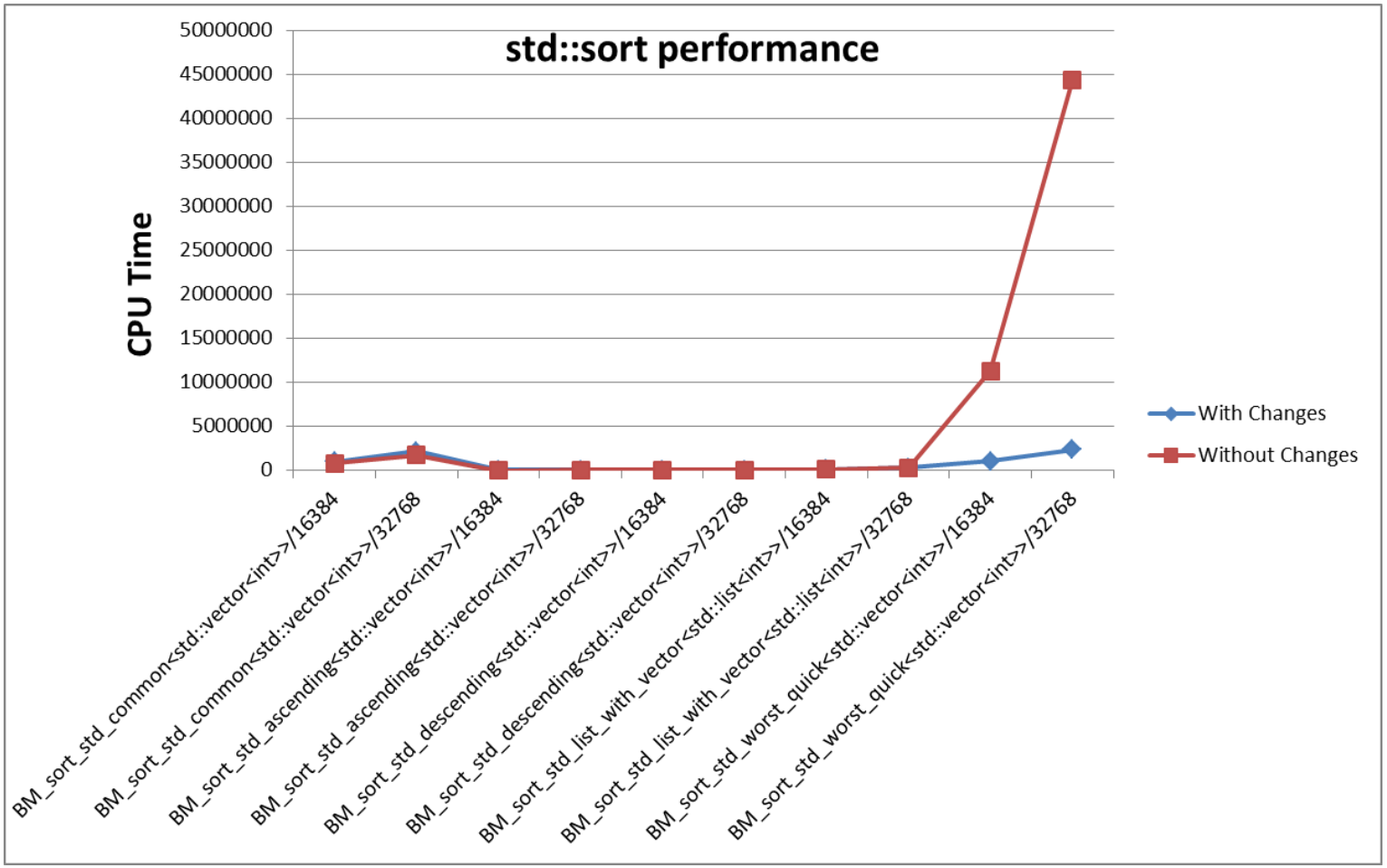
- Convert to introsort*
  - Sorting technique, which begins with quicksort and switches to heapsort after recursion reaches a threshold
  - Worst case complexity of O(NlogN)

- Eliminate recursion
  - Replaced memory Intensive recursive calls with stack
  - std::stack uses std::deque, which uses std::algorithm :(

- Improved worst case time complexity by a factor of 10
  - https://reviews.llvm.org/D36423

https://en.wikipedia.org/wiki/Introsort

Sorting Results Plot (With std-benchmark)



* https://github.com/hiraditya/std-benchmark

Thank You