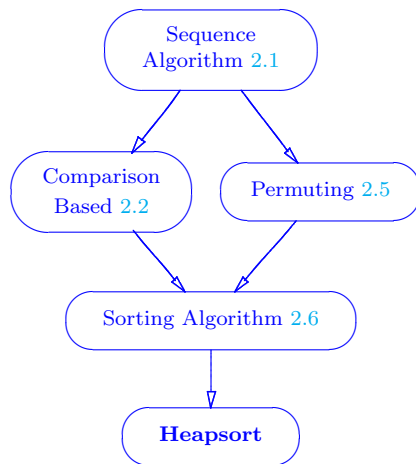


2.6.1. Heapsort

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Refinement of: Sequence Sorting Algorithm (§2.6), therefore of Comparison Based (§2.2), Permuting (§2.5), Sequence Algorithm (§2.1).

Prototype:

```
template<class RandomAccessIterator>
void heapsort(RandomAccessIterator first,
              RandomAccessIterator last)
```

Effects: Standard effects of a Sequence Sorting Algorithm (§2.6). In brief: the elements in $[first, last)$ after execution are a permutation of the original elements in the range, and they are in nondecreasing order according to the comparison operator.

Asymptotic complexity: Let $N = last - first$.

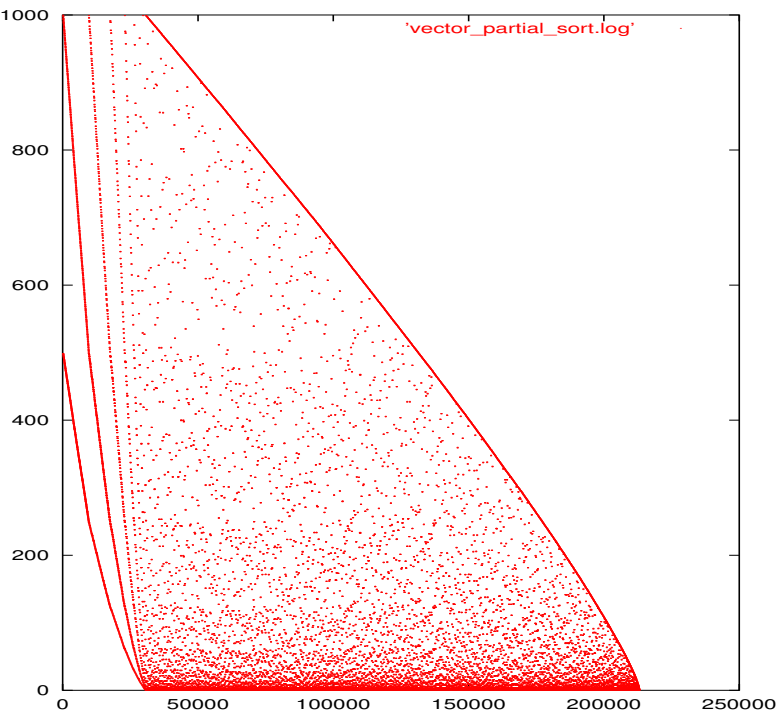
- Average case (random data): $O(N \log N)$
- Worst case: $O(N \log N)$

Complexity in terms of operation counts:

- Average case:
 - Value comparisons: $N \log_2 N + 0.36N$
 - Value assignments: $1.2N \log_2 N + 3.2N$
 - Iterator operations: $12.4N \log_2 N + 10N$
 - Integer operations: $14.5N \log_2 N + 17N$
- See also Sorting Algorithm Operation Counts (§2.91) for sample counts on random data for heapsort and other sorting algorithms.

2.6.2. Heapsort iterator trace plot

Compare with other algorithms: Introsort (§2.6.4), Mergesort (§??).



One thousand elements are being sorted by the version of heapsort (actually a special case of `partial_sort`) implemented in **SGI STL**. From time 0 to about time 30,000 the algorithm is building a heap (with algorithm `makeheap`). Then, for the rest of the time, it is repeatedly extracting the maximum element and reheaping.