

Sorting run stats:

Number of values \ Sorting technique	Insertion	Bubble	Quick	Merge	Comments
10000	<1 sec	<1 sec	<1 sec	<1 sec	
50000	2 secs	8 secs	<1 sec	<1 sec	
100000	8 secs	31 secs	<1 sec	<1 sec	A slight increase in memory in bubble
500000	3 min 16 secs	13 min 57 secs	<1 sec	<1 sec	A slight increase in memory in insertion and bubble sort
1000000	13 min and 21 secs	61 min 9 secs	<1 sec	<1 sec	
5000000	-	-	2 secs	6 secs	The memory consumption during merge sort was more than 90%
10000000	-	-	2 secs	Killed during sorting	The memory consumption reached 50% during quick sort while during merge sort the memory went out of bounds
50000000	-	-	27 secs	-	The CPU went to 100% while memory consumption was more than 90%
100000000	-	-	Killed during generating random numbers	-	

Note: '-' denotes test was not run

Observations:

- As the load increased the time taken increased for each algorithm
- Insertion sort and Bubble sort are much slower than quick and merge sort which is also seen by their worst Big O i.e. $O(n^2)$
- Even though merge sort is great in performance but the memory limitation hit strong. It died much before quick sort which never crashed during sorting
- These observations were recorded through empirical analysis. Hence the input remained same throughout. The hardware was a limitation as the upper limit for quick sort could not be found out while merge sort though high in performance bowed away meekly.