

## Quicksort: empirical analysis



### Running time estimates:

- Home PC executes  $10^8$  compares/second.
- Supercomputer executes  $10^{12}$  compares/second.

**molveto**

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2010: Gigascale computing  $10^9$  Intel Core i7 147,600 MIPS at 3.33 GHz.  
Insertion:  $1M^2 / 10^8 / 3600 \sim 2.8$  hours  
Quick:  $1M * \lg(1M) / 10^8 \sim 0.2$  segs

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computer	insertion sort ( $N^2$ )			mergesort ( $N \log N$ )			quicksort ( $N \log N$ )		
	thousand	million	billion	thousand	million	billion	thousand	million	billion
home	instant	2.8 hours	317 years	instant	1 second	18 min	instant	0.6 sec	12 min
super	instant	1 second	1 week	instant	instant	instant	instant	instant	instant

Lesson 1. Good algorithms are better than supercomputers.

Lesson 2. Great algorithms are better than good ones.