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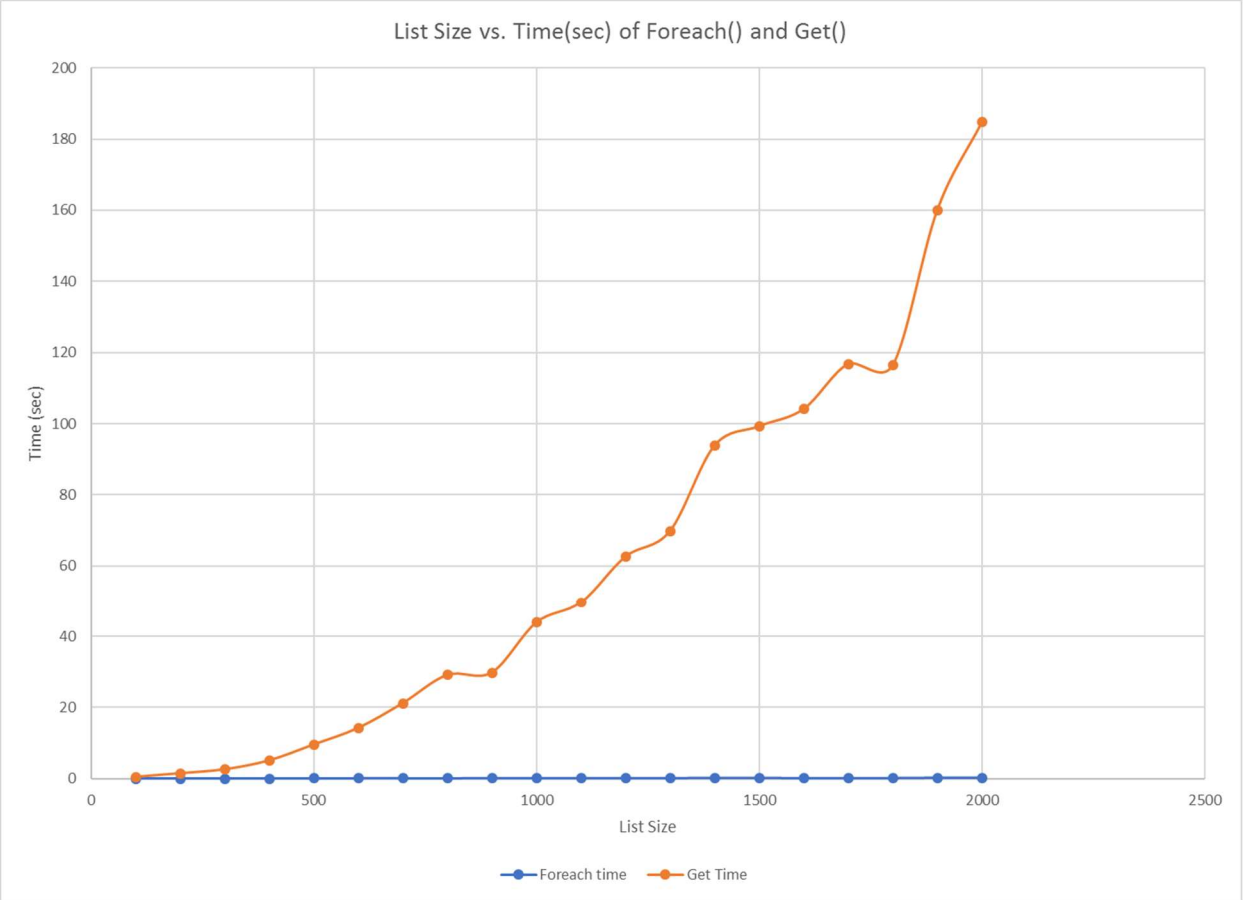
5/10/17
CPE 103
Professor Hatalsky

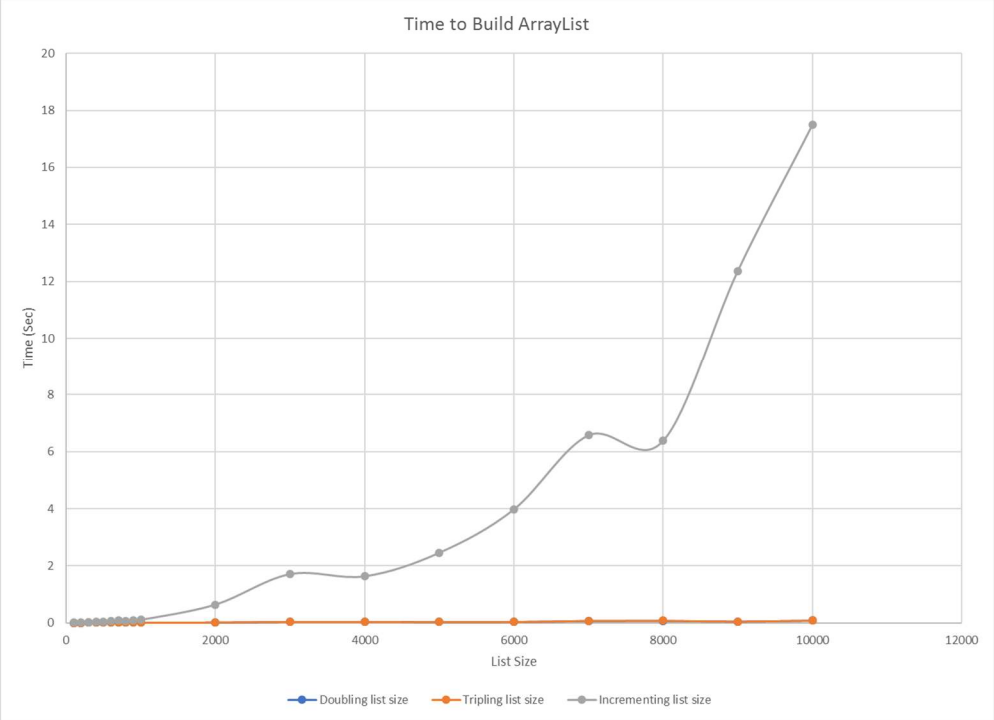
Empirical Study: LinkedList vs ArrayList

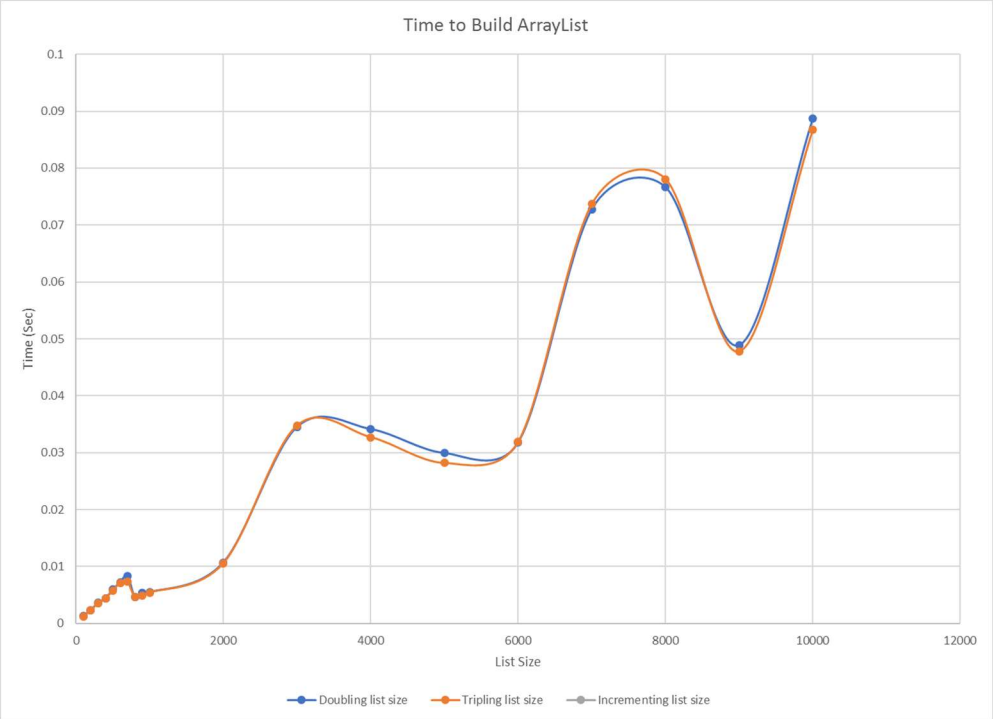
4.1: 'Foreach' function vs 'Get'



- The get() function is increasing on the order $O(n^2)$, as seen by the chart above
- The foreach() function is increasing much slower, and you, the chart does not show it, but it is increasing on the order of O(n)
- Note: The lists are built, then a function is applied to each element of the list 100 times, using either the foreach() or get() function
- Note 2: All lists in this study are LinkedLists

4.2 ArrayList Build Strategies

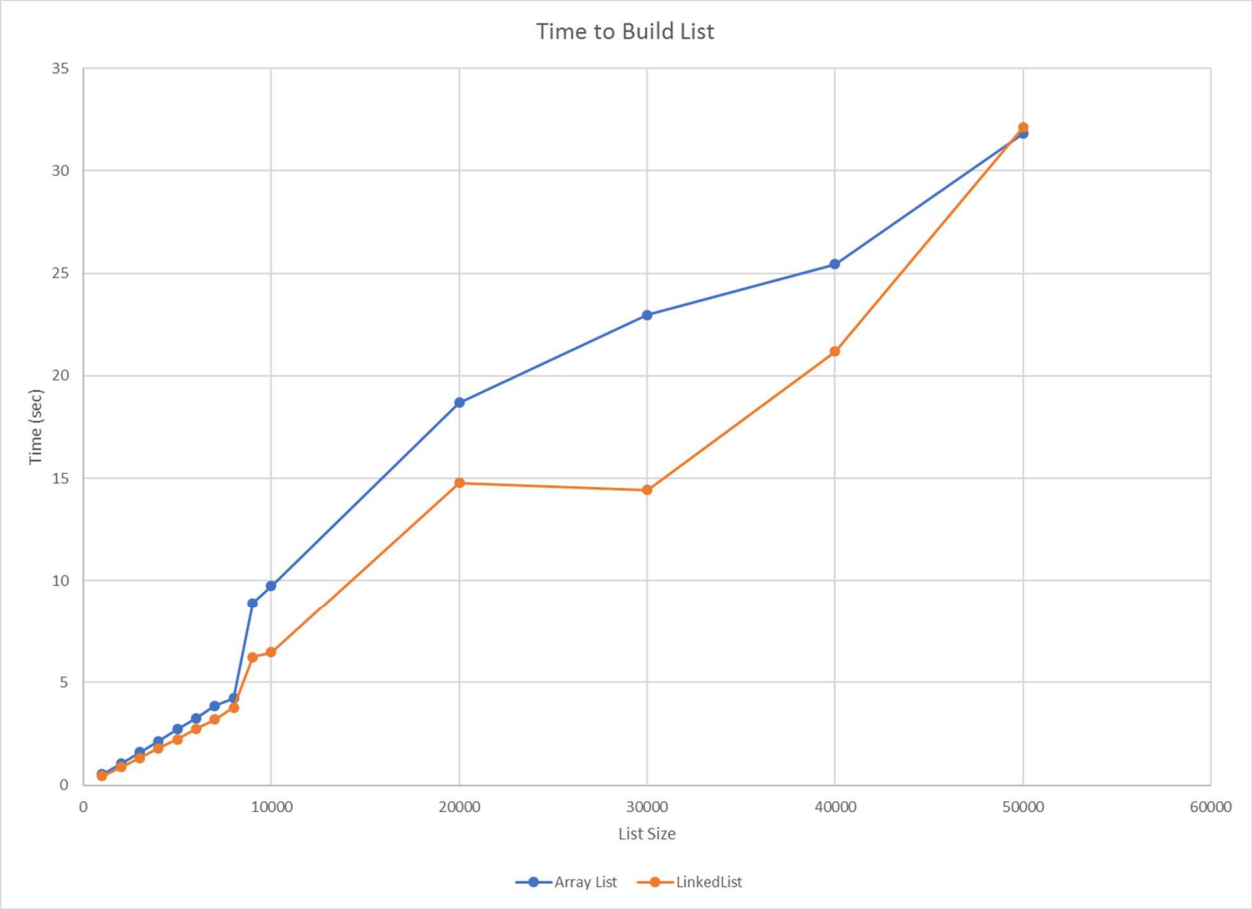




- Building the ArrayList by incrementing the size as needed is of the order $O(n^2)$
- Building the ArrayList by doubling and tripling the size as needed is nearly identical, of the order O(n)

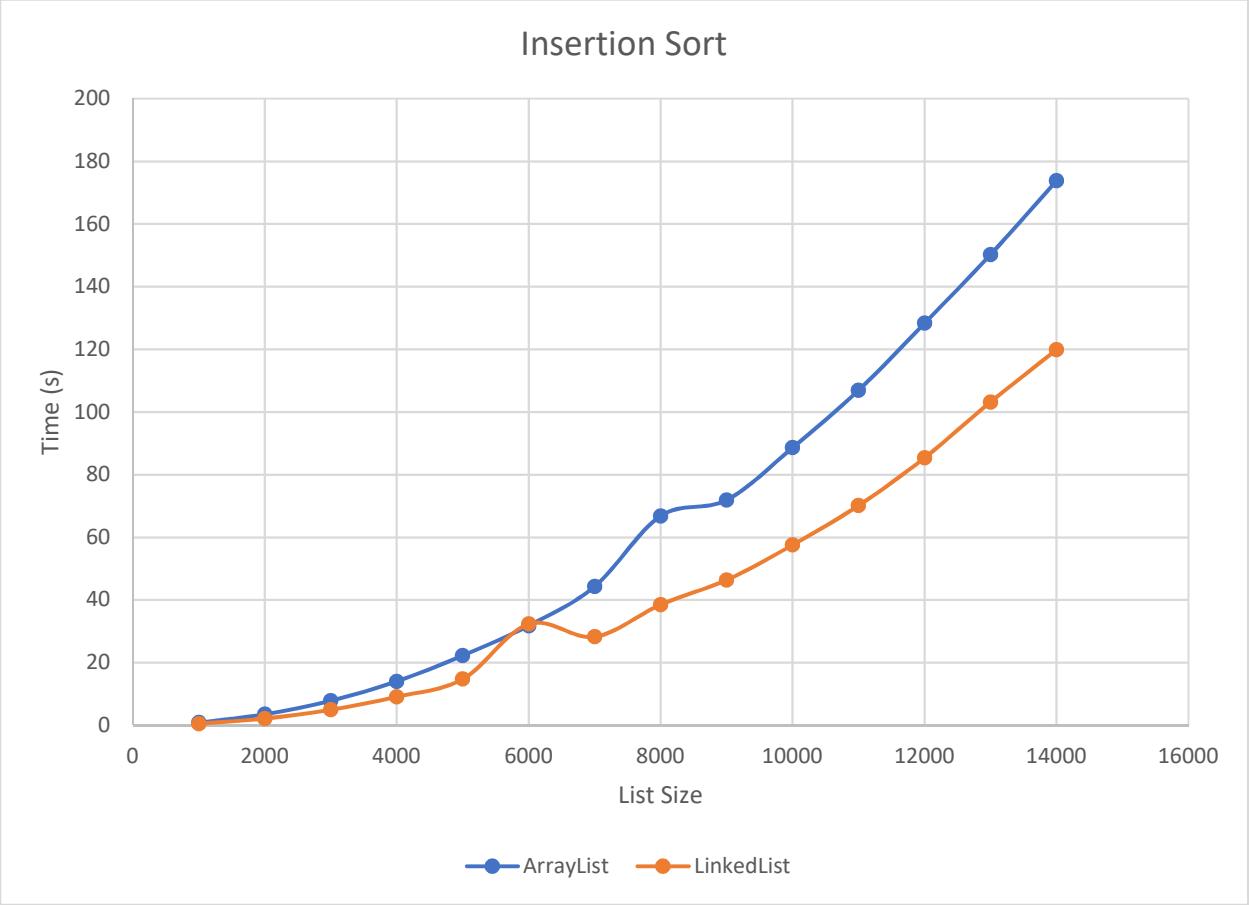
4.2.1 ArrayList vs. LinkedList

A. Load Times



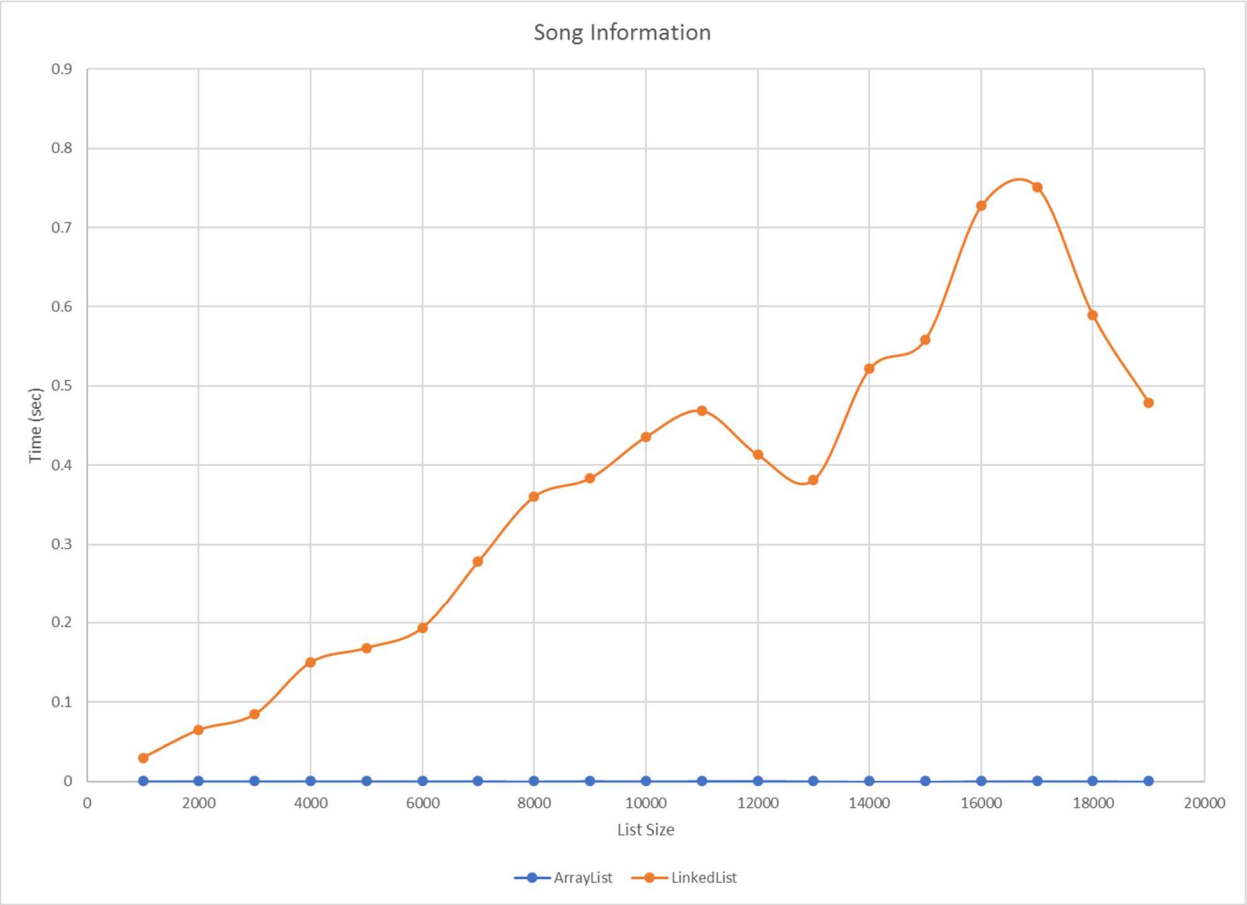
- Time to build the ArrayList is overall slightly longer than building the LinkedList
- Both ArrayList and LinkedList are increasing on the order of O(n)
- Note: Both the building of the ArrayList and LinkedList is optimized, i.e. the ArrayList is built by adding to the end of the list, and the LinkedList is built by adding to front
- Note 2: Lists are built 100 times each

B. Sort Times



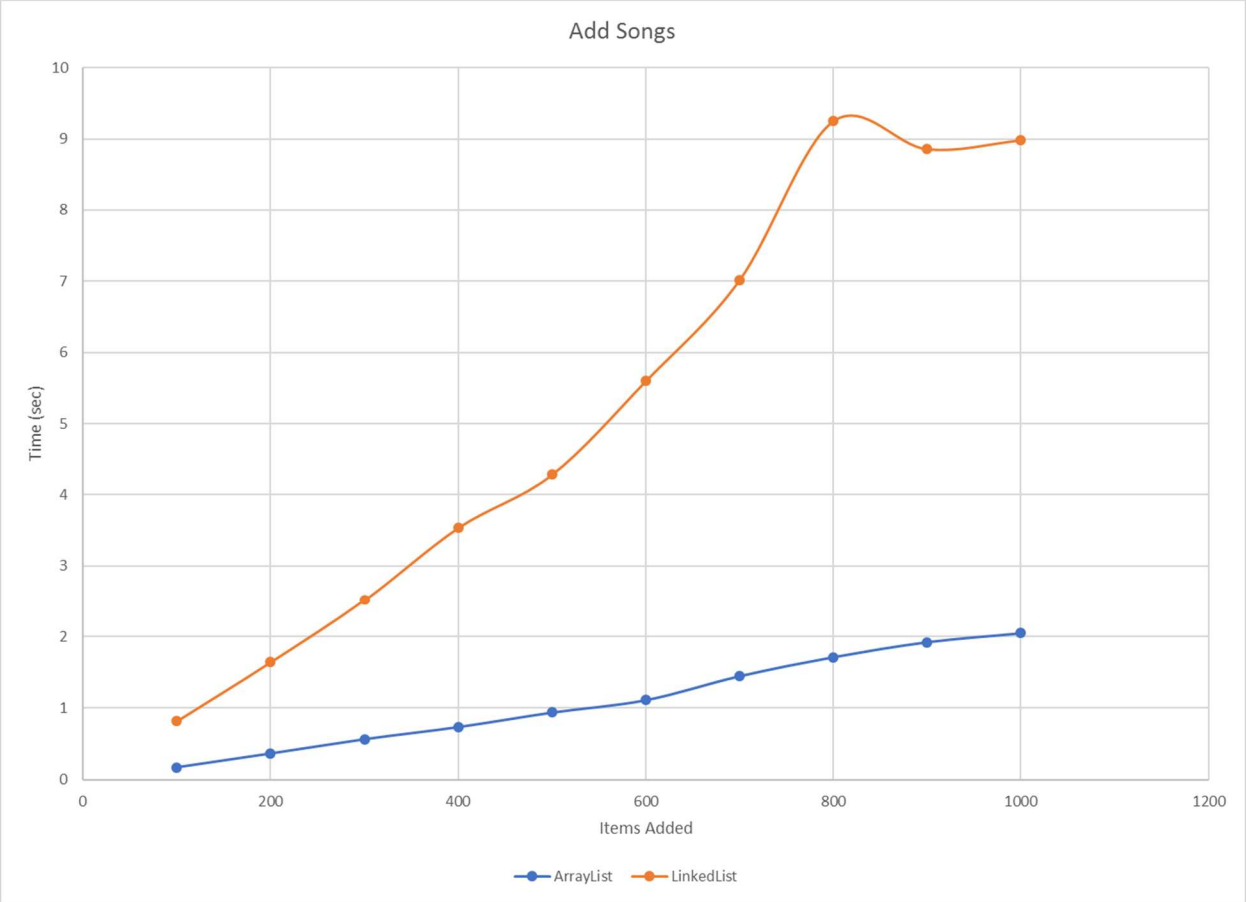
- The ArrayList generally takes longer to sort than the LinkedList
- Both ArrayList and LinkedList are increasing on the order of $O(n^2)$, because they both use the same sort method
- Note: The lists are built using the same random seed, then the LinkedList is flipped, so that the sorted lists are identical (not timed).
- Note 2: The sort strategies differ slightly; the LinkedList builds a separate list while sorting, which is returned, while the ArrayList simply mutates the list, then returns that list

C. Song Information Times



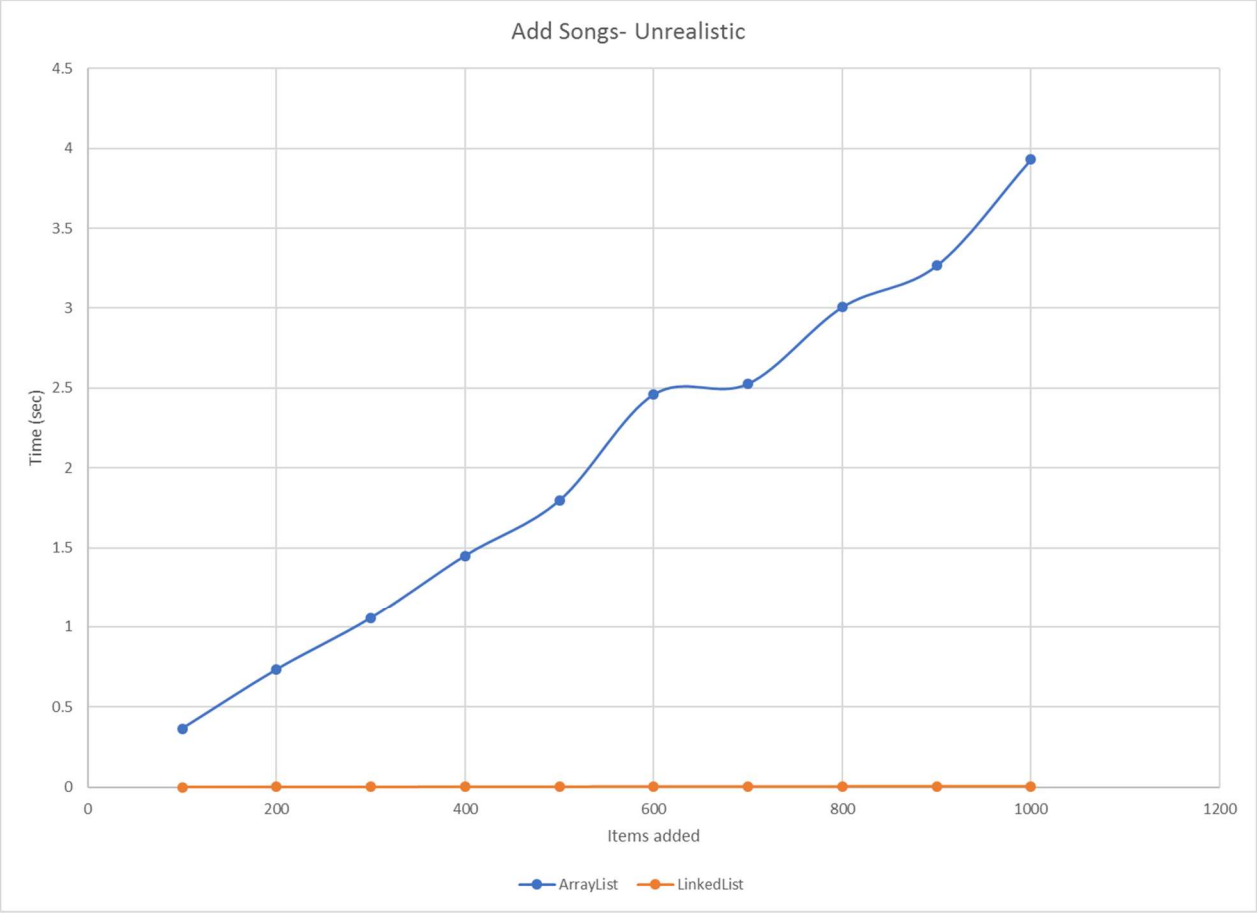
- LinkedList get() increases on the order of O(n)
- ArrayList get() increases on the order of O(1)
- Note: Both get()'s are random elements, however they are the same random elements by using the same random seed.
- Note 2: get() is called 50 times for each list, with varying sizes

D.1. Add Songs



- ArrayList is increasing at a much slower rate than LinkedList
- Both ArrayList and LinkedList are increasing on the order O(n)
- Note: Initial list is 9000 songs, and songs are added at arbitrary positions

D.2. Add Songs (Unrealistic)



- LinkedList is increasing much slower than ArrayList
- Both ArrayList and LinkedList increasing on the order O(n)
- Note: initial List length is 9000 songs, however items are added at beginning of list