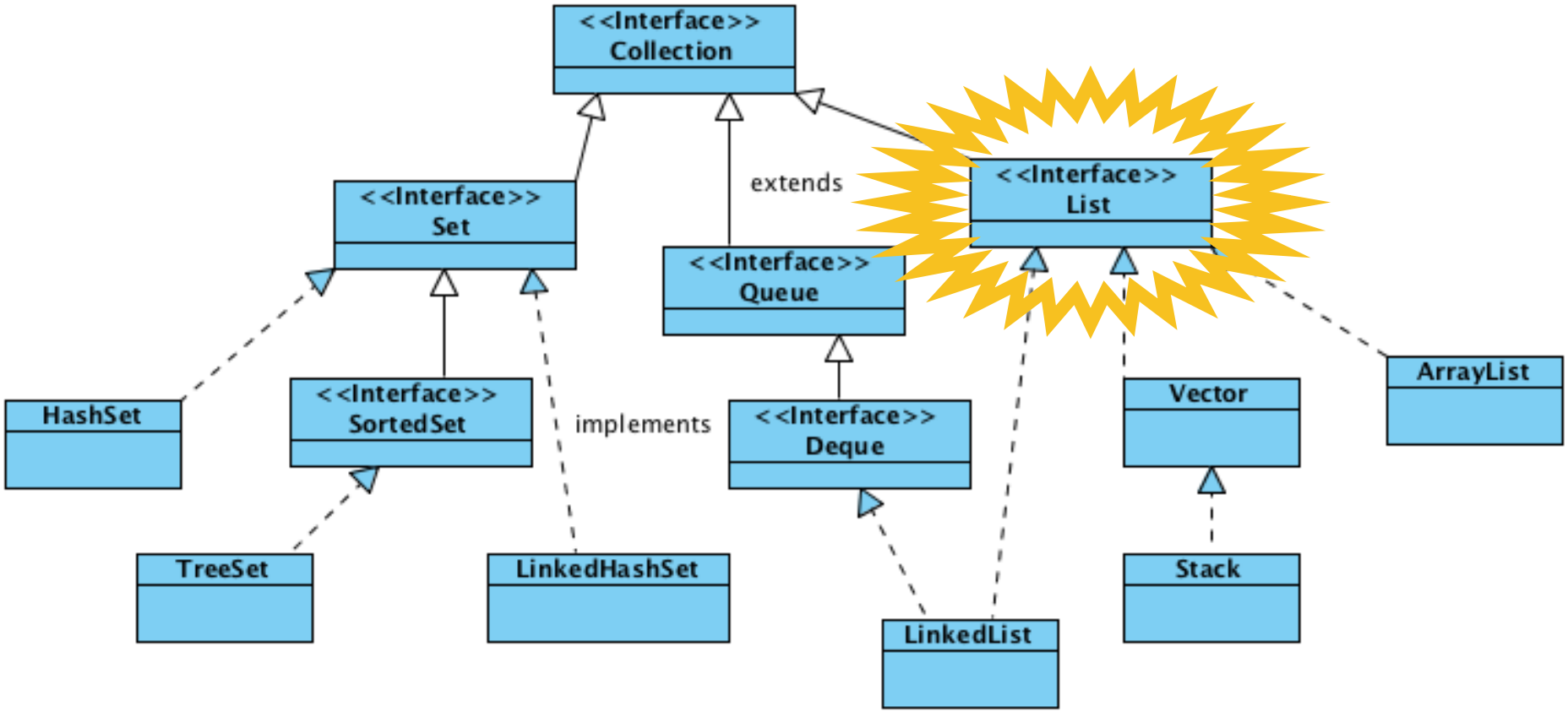
Lists

Arrays reloaded

Collection Family Tree



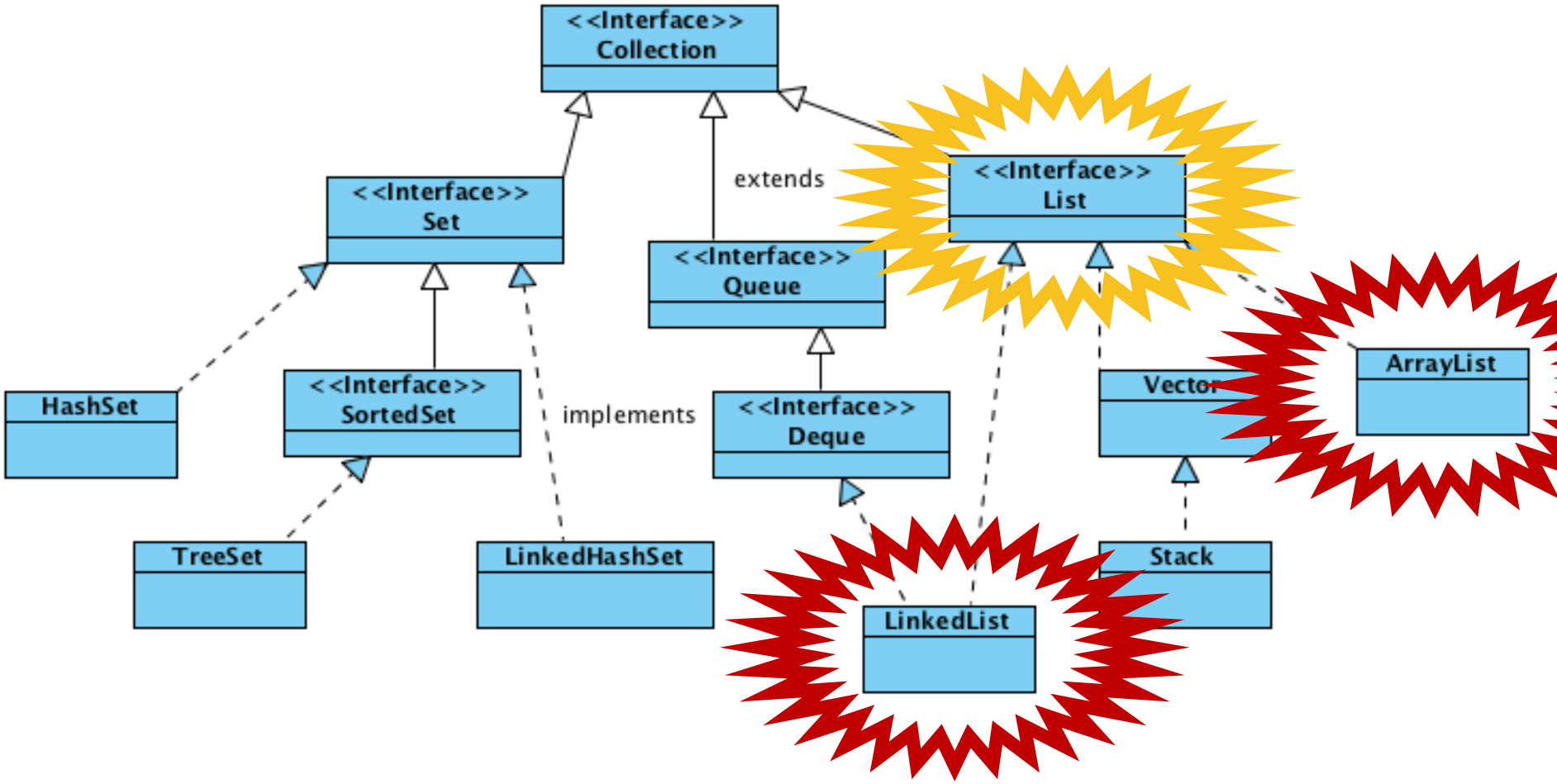
Lists == Arrays “Reloaded”

- Lists are (probably) the most widely used Java collections
- Like arrays
  - full visibility and control over the ordering of its elements
  - may contain duplicates
- Unlike arrays
  - resize smoothly

List interface

- Add/remove elements
  - boolean **add**(element)
  - boolean **remove**(object)
- Positional Access
  - element **get**(index)
  - element **set**(index, element)
  - void **add**(index, element)
  - element **remove**(index)
- Search
  - boolean **contains**(object)
  - int **indexOf**(object)

Collection Family Tree



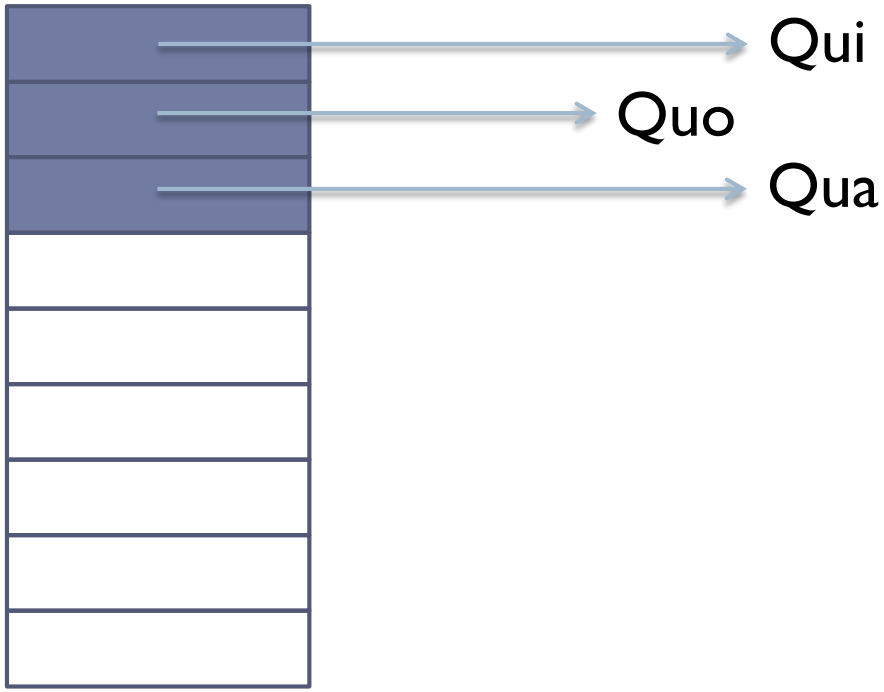
Data and constructor

- ArrayList

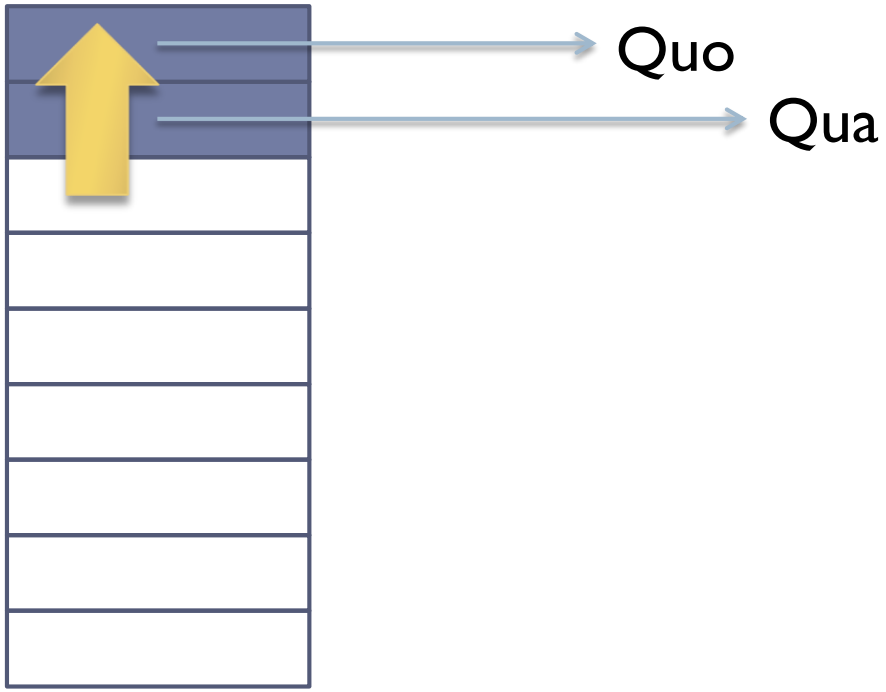
```
List<String> words;

public WordSet() {
    words = new ArrayList<String>();
}
```

ArrayList



ArrayList – Delete



myList.remove(0) ;

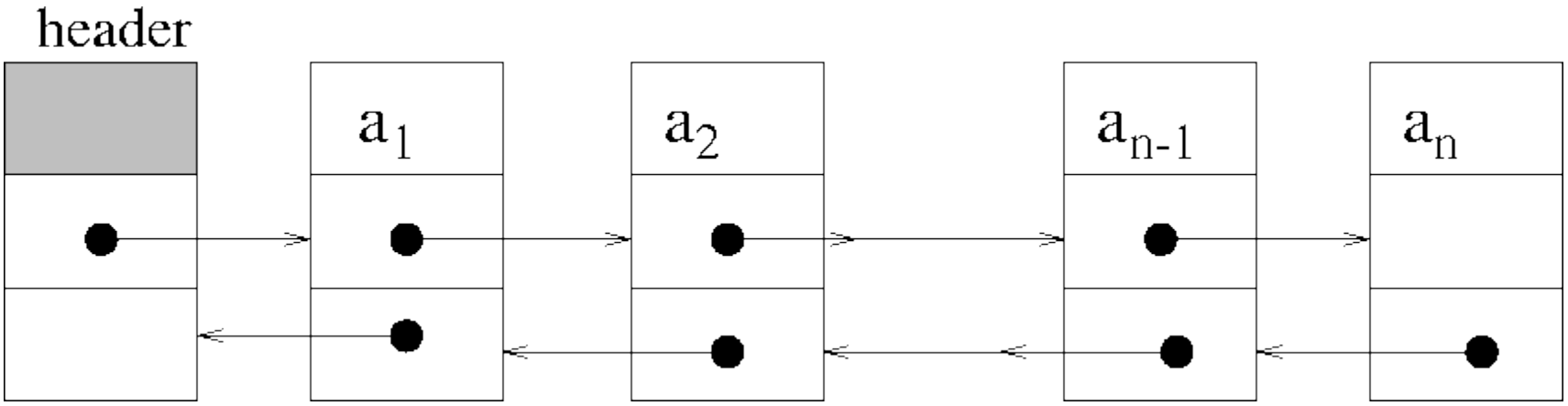
Data and constructor

- LinkedList

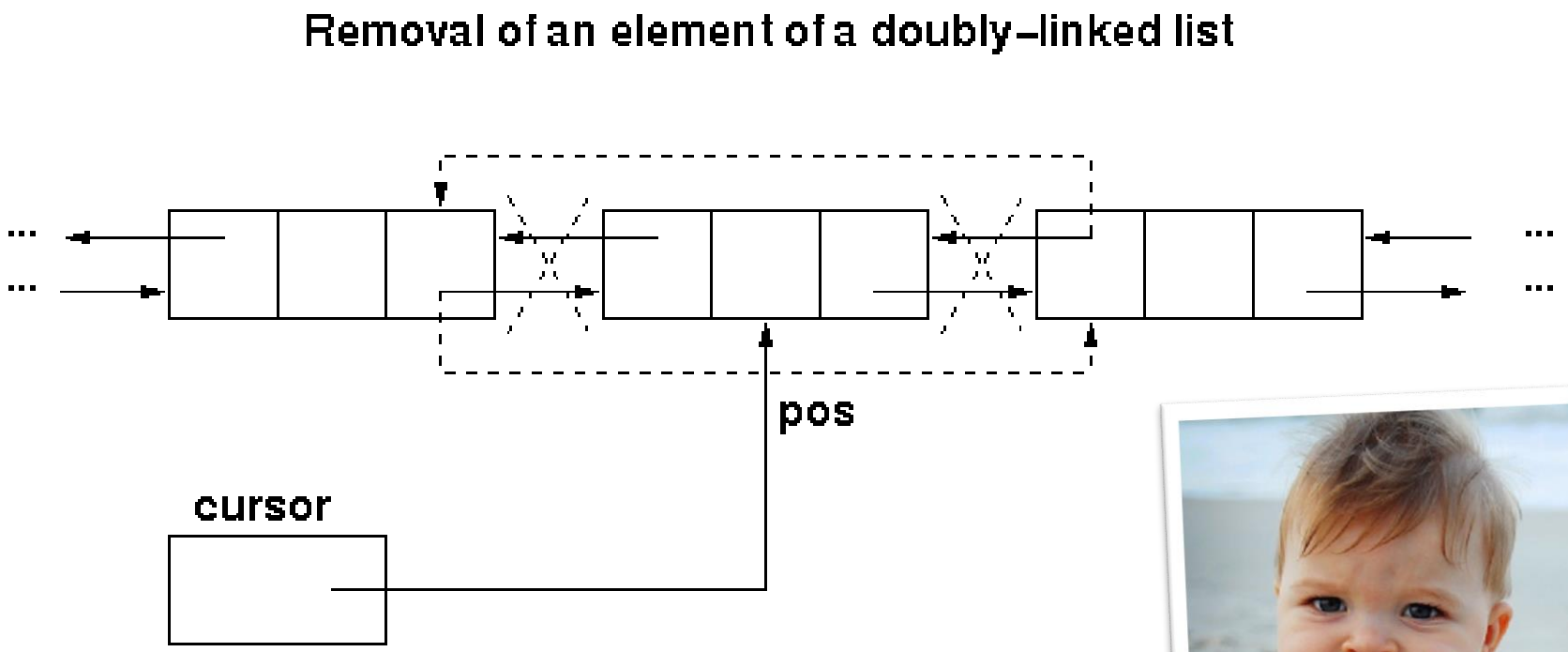
```
List<String> words;

public WordSet() {
    words = new LinkedList<String>();
}
```

LinkedList



LinkedList – Delete



ArrayList vs. LinkedList

	ArrayList	LinkedList
add(element)		
remove(object)		
get(index)		
set(index, element)		
add(index, element)		
remove(index)		
contains(object)		
indexOf(object)		

ArrayList vs. LinkedList

	ArrayList	LinkedList
add(element)	IMMEDIATE	IMMEDIATE
remove(object)		
get(index)		
set(index, element)		
add(index, element)		
remove(index)		
contains(object)		
indexOf(object)		

ArrayList vs. LinkedList

	ArrayList	LinkedList
add(element)	IMMEDIATE	IMMEDIATE
remove(object)	SLUGGISH	LESS SLUGGHISH
get(index)		
set(index, element)		
add(index, element)		
remove(index)		
contains(object)		
indexOf(object)		

ArrayList vs. LinkedList

	ArrayList	LinkedList
add(element)	IMMEDIATE	IMMEDIATE
remove(object)	SLUGGISH	LESS SLUGGHISH
get(index)	IMMEDIATE	SLUGGISH
set(index, element)	IMMEDIATE	SLUGGISH
add(index, element)		
remove(index)		
contains(object)		
indexOf(object)		

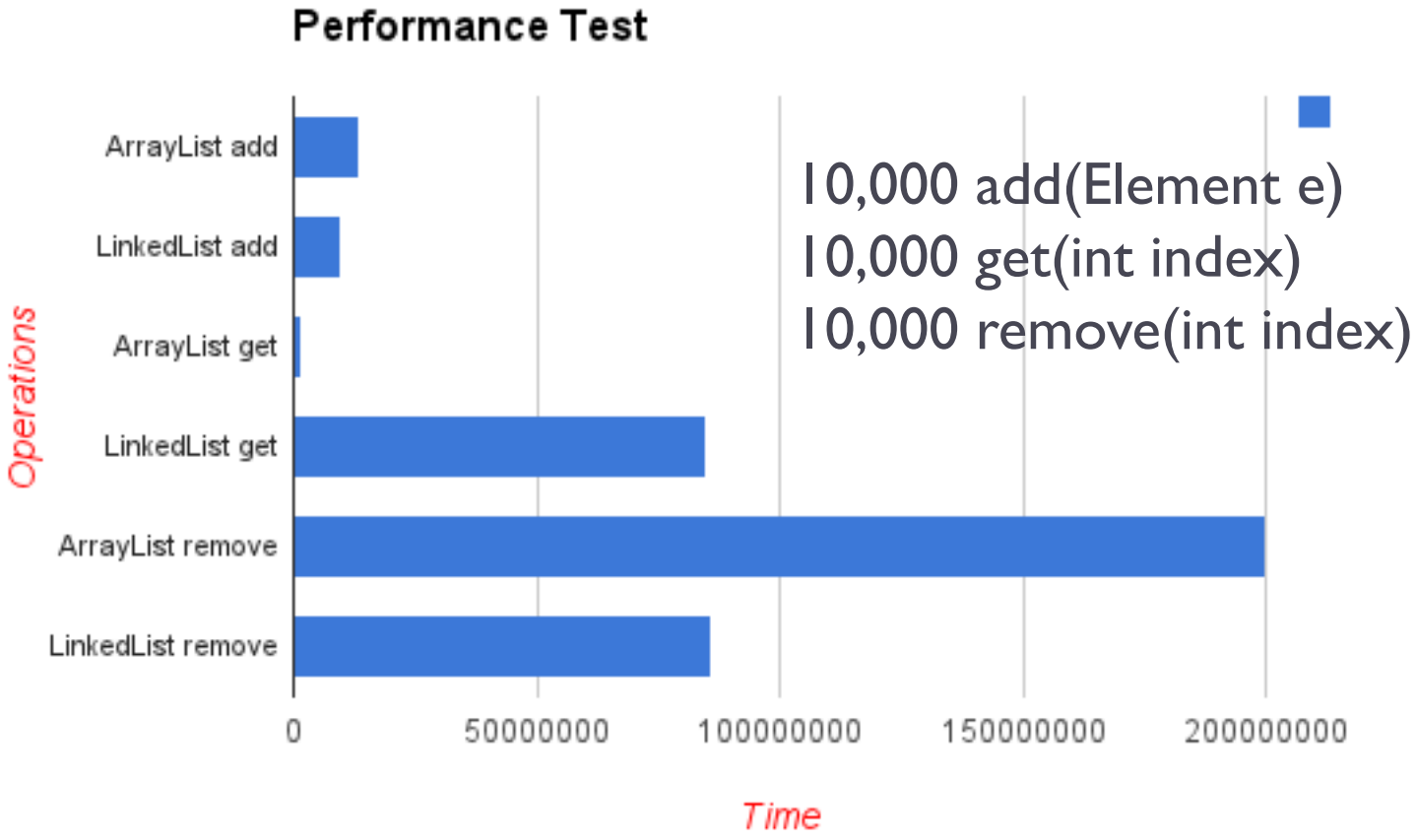
ArrayList vs. LinkedList

	ArrayList	LinkedList
add(element)	IMMEDIATE	IMMEDIATE
remove(object)	SLUGGISH	LESS SLUGGHISH
get(index)	IMMEDIATE	SLUGGISH
set(index, element)	IMMEDIATE	SLUGGISH
add(index, element)	SLUGGISH	SLUGGISH
remove(index)	SLUGGISH	SLUGGISH
contains(object)		
indexOf(object)		

ArrayList vs. LinkedList

	ArrayList	LinkedList
add(element)	IMMEDIATE	IMMEDIATE
remove(object)	SLUGGISH	LESS SLUGGHISH
get(index)	IMMEDIATE	SLUGGISH
set(index, element)	IMMEDIATE	SLUGGISH
add(index, element)	SLUGGISH	SLUGGISH
remove(index)	SLUGGISH	SLUGGISH
contains(object)	SLUGGISH	SLUGGISH
indexOf(object)	SLUGGISH	SLUGGISH

ArrayList vs. LinkedList



*source: http://www.programcreek.com/2013/03/arraylist-vs-linkedlist-vs-vector/

Big O notation

- O(*n*)
  - Used to compare different implementation of a Collection
  - **O(*n*)** is used to note that the time required for the execution of an algorithm rises like *n*
  - *n* is usually intended as the dimension of the data.

- Examples
  - **O(*n*^2)** takes a time that is quadratic-dependent by *n*
  - **O(*n*)** takes a time that is linear-dependent by *n*
  - **O(log *n*)** takes a time that is dependent from the log *n*
  - **O(C)** or **O(1)** is a constant-time operation

ArrayList vs. LinkedList

	ArrayList	LinkedList
add(element)	O(1)	O(1)
remove(object)	O(n) + O(n)	O(n) + O(1)
get(index)	O(1)	O(n)
set(index, elem)	O(1)	O(n) + O(1)
add(index, elem)	O(1) + O(n)	O(n) + O(1)
remove(index)	O(n)	O(n) + O(1)
contains(object)	O(n)	O(n)
indexOf(object)	O(n)	O(n)
it.add()	O(n)	O(1)
it.remove()	O(n)	O(1)

ArrayList vs. LinkedList

- ArrayList
  - **get**(index) and **set**(index, element) are **O(1)**
  - **adding** or **removing** an element in last position are **O(1)**
  - **add(element)** with resize could cost **O(n)**
- LinkedList
  - iterator.remove() and listIterator.add() are **O(1)**
  - **adding** or **removing** an element in first position are **O(1)**
- Memory footprint
  - LinkedList uses more memory than an ArrayList

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