

Implementing the List Interface



From ArrayLists to LinkedLists

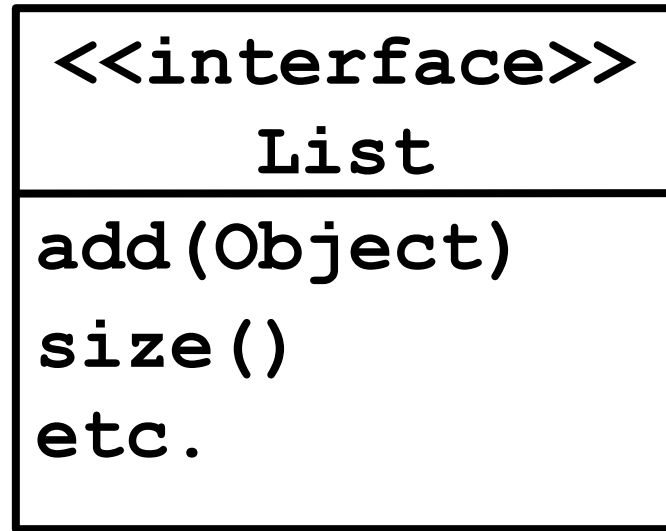


This work is licensed under a [Creative Commons Attribution-ShareAlike 4.0 International License](https://creativecommons.org/licenses/by-sa/4.0/)
by Christine Alvarado, Mia Minnes, and Leo Porter, 2015.

By the end of this video you will be able to...

- Describe and draw the structure of a LinkedList
- Describe an advantage of a LinkedList over an ArrayList

ADT



**Two ways to
implement the same
functionality!**

**Data
Structures**

LinkedList

ArrayList

42	95	15	19	24	55
0	1	2	3	4	5

An ArrayList implements the List interface using an array

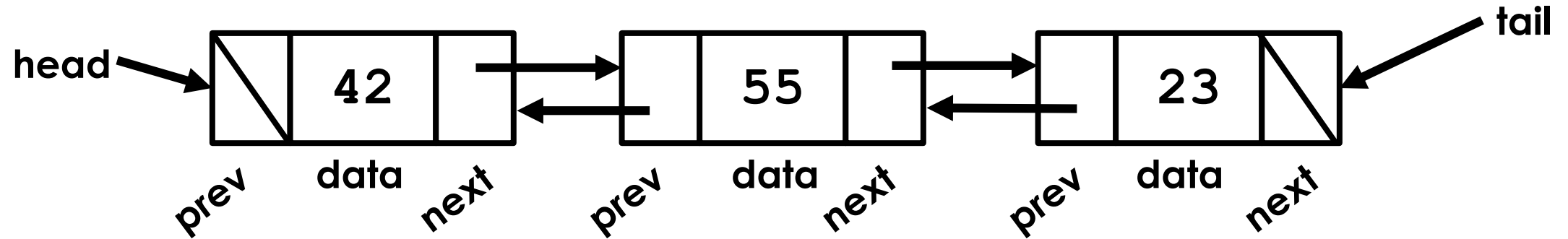
How long does it take to add an element to the front of an ArrayList?

42	95	15	19	24	55
0	1	2	3	4	5

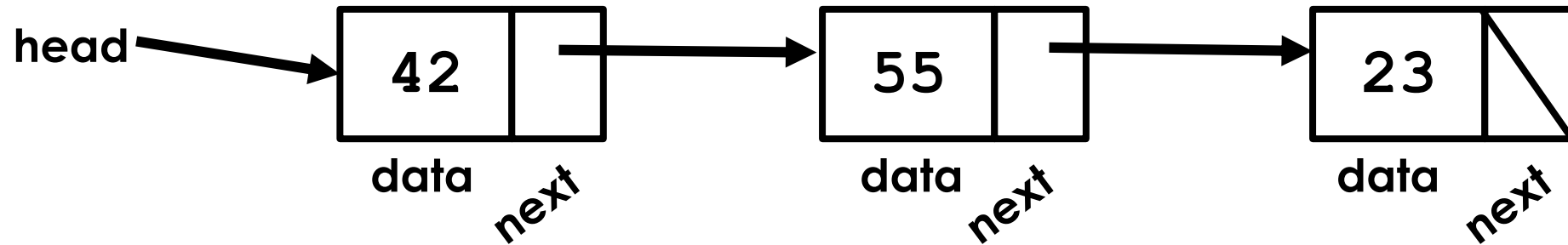
**An ArrayList implements
the List interface using
an array**

**ADT specifies functionality,
but not efficiency!**

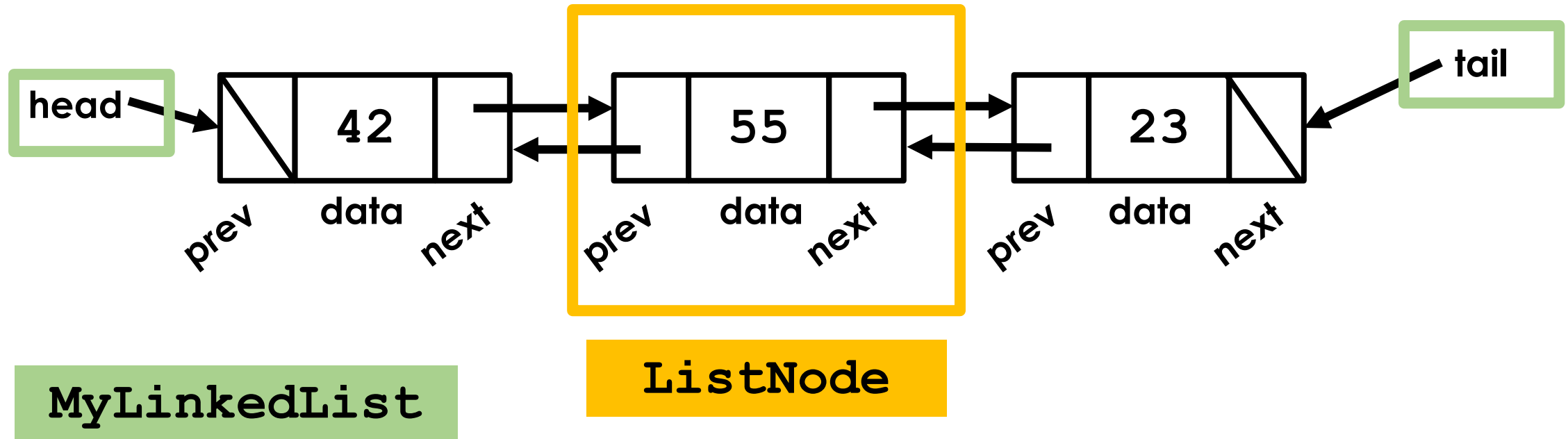
(Doubly) Linked List, in pictures



Singly Linked List, in pictures

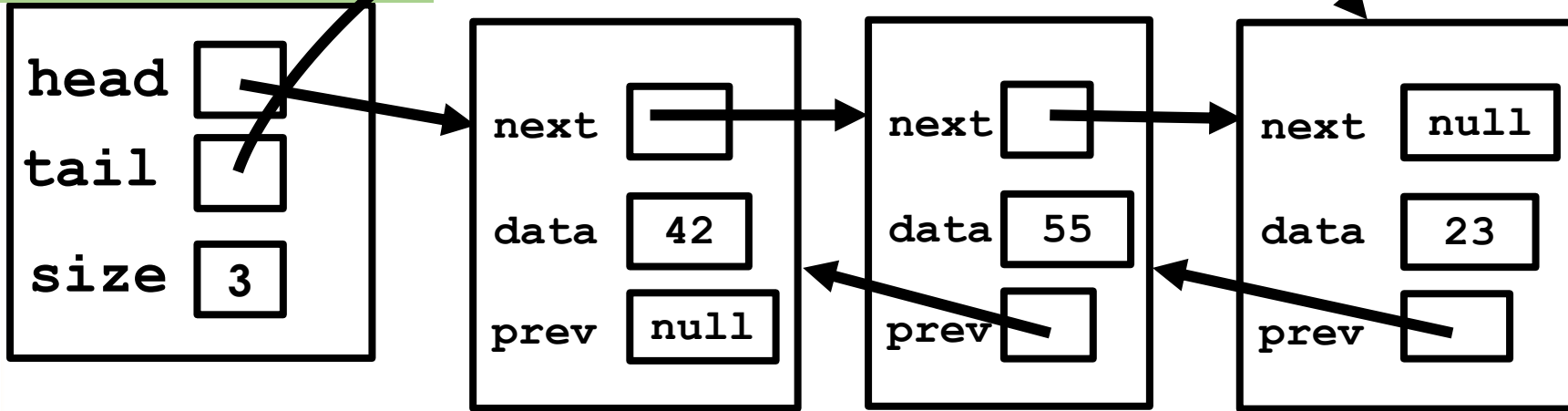


Two classes in a LinkedList



Two classes in a LinkedList

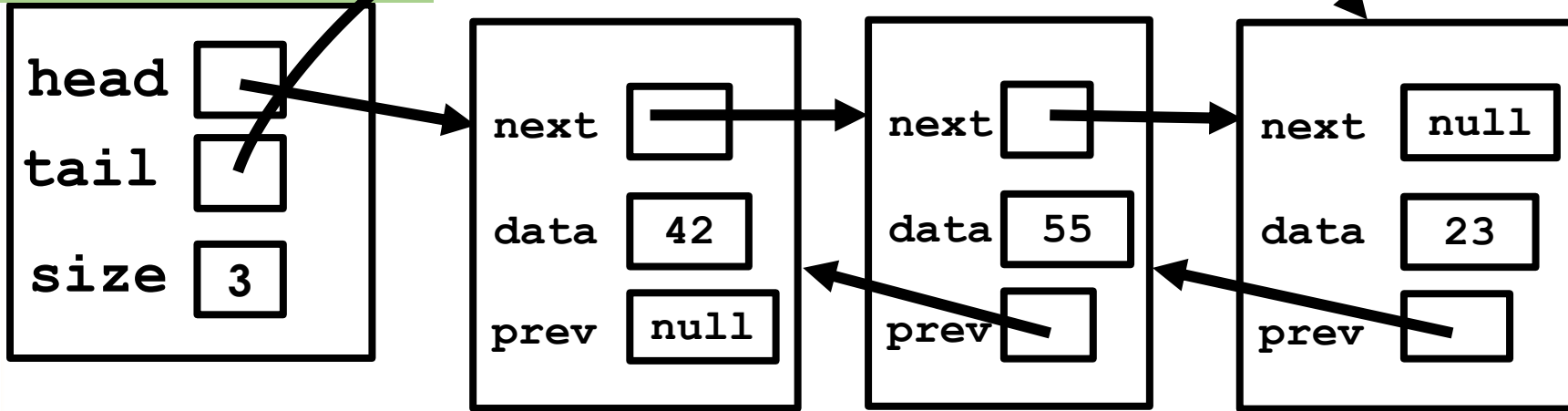
MyLinkedList
object



ListNode objects

Alternate Implementation: Sentinel nodes

MyLinkedList
object

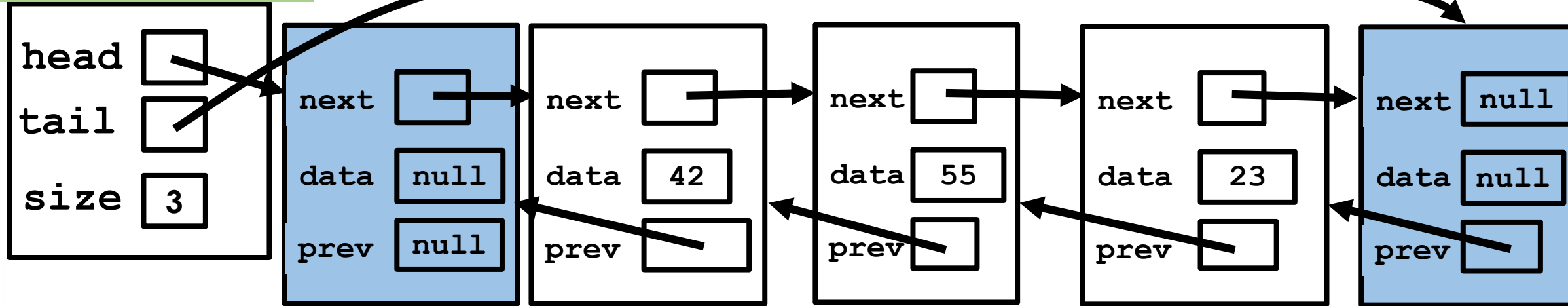


ListNode objects

Alternate Implementation: Sentinel nodes

Sentinel or dummy nodes

MyLinkedList
object



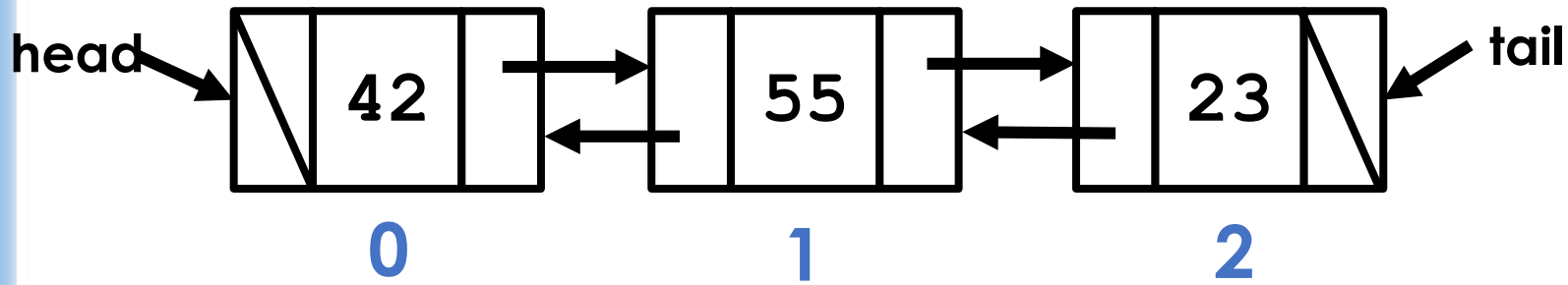
ListNode objects

42	95	15	19	24	55
0	1	2	3	4	5

**An ArrayList implements
the List interface using
an array**

**How long does it take to get an element at
a particular index in an ArrayList**

$O(1)$



A LinkedList implements the List interface using a LinkedList data structure

How long does it take to get an element at a particular index in a LinkedList

$O(N)$