

CS151 Intro to Data Structures

Doubly LinkedLists

Announcements

- HW00 Discussion
 - Mentimeter 8577 2912
- HW01 released
 - Will be using your ExpandableArray from last lab
- lab today will be on singly linked lists and doubly linked lists

Logistics

I need to make sure my roster is correct

3688 7684

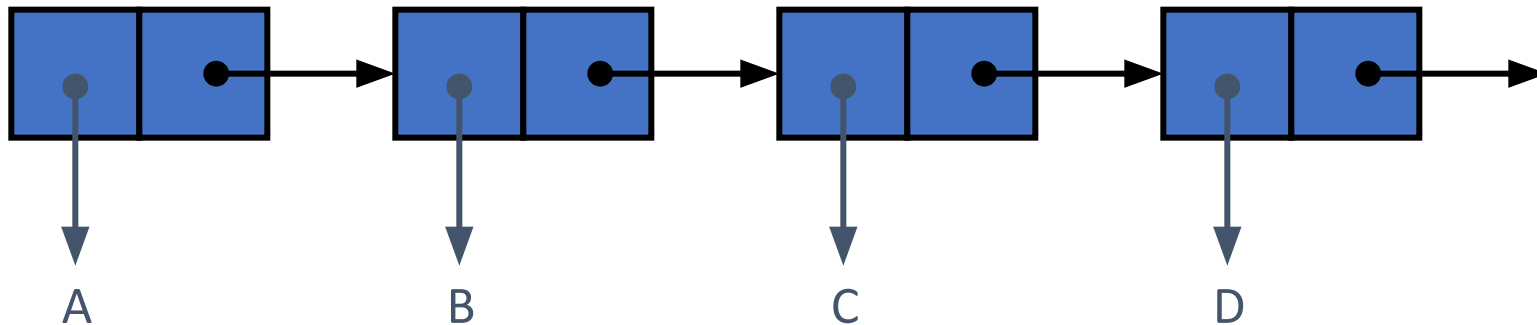
Outline

- LinkedLists review
- Fancy LinkedLists (Doubly Linked Lists)

Linked List

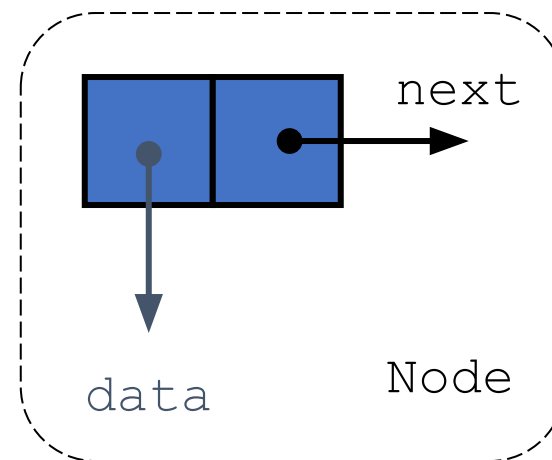
Linked List

- A linked list is a lists of objects (**nodes**)
- The **nodes** form a linear sequence
- Linked lists are typically unbounded, that is, they can grow infinitely.



A node

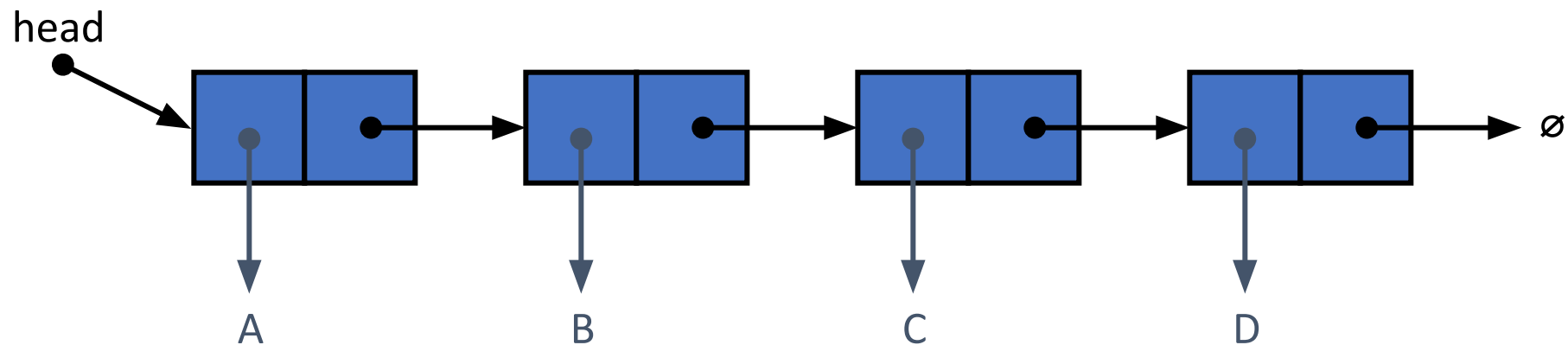
```
public class Node<T> {  
    private T data;  
    private Node next;  
}
```



Linked List

How might we loop over all of the elements of a linked list?

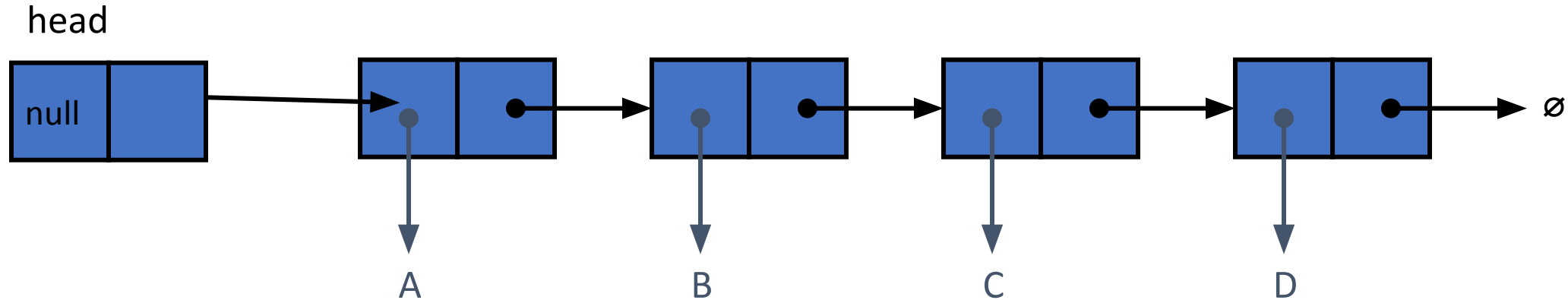
```
public class Node<T> {  
    private T data;  
    private Node next;  
}
```



Linked List Operations

- Access
- Insertion
- Removal

Access Operation



- Check if the head node is what you are looking for
- Iterate through nodes:
 - Stop when found
 - Otherwise return null

Access Operation

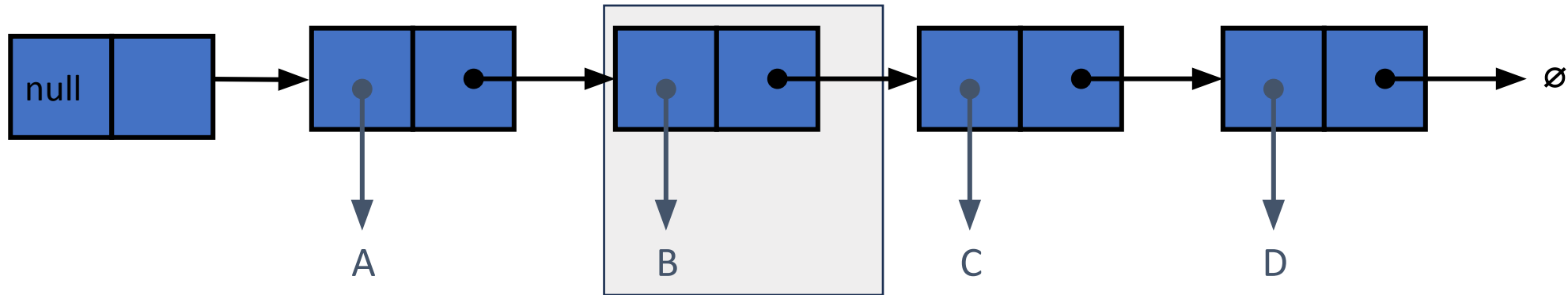
- Computational Complexity?
 - $O(n)$

Insert Operation

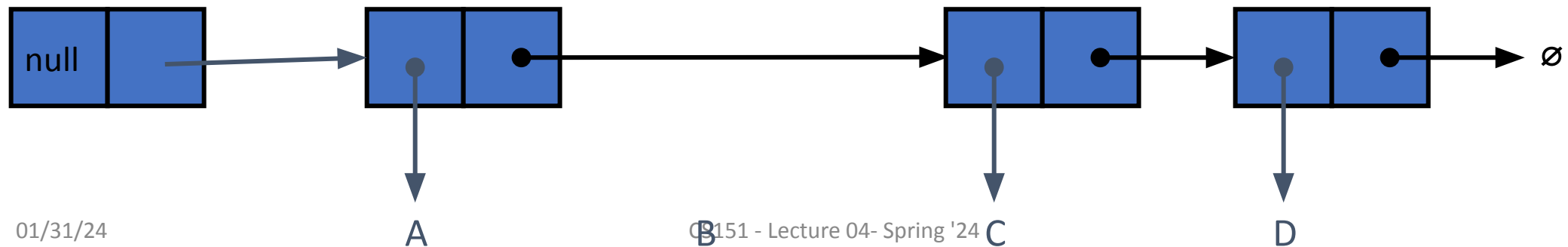
- Computational complexity?
 - Insert at head?
 - $O(1)$
 - Insert at tail?
 - $O(n)$
 - Insert at arbitrary location? (middle of list)
 - $O(n)$

Remove Operation `remove("B")`

head



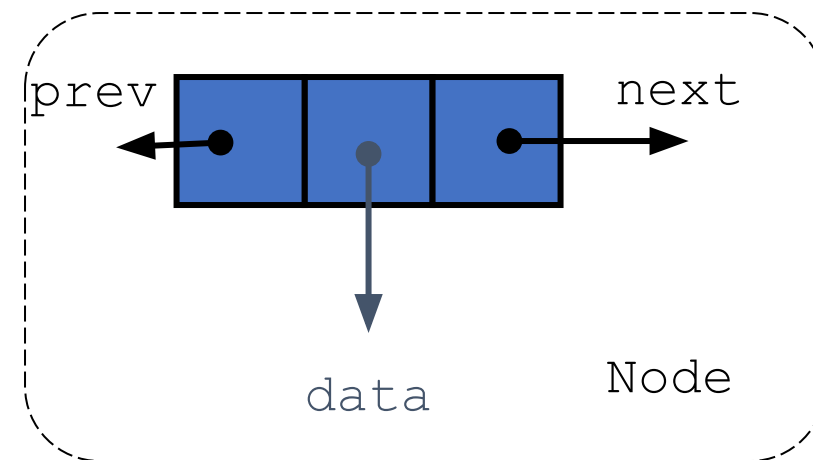
head



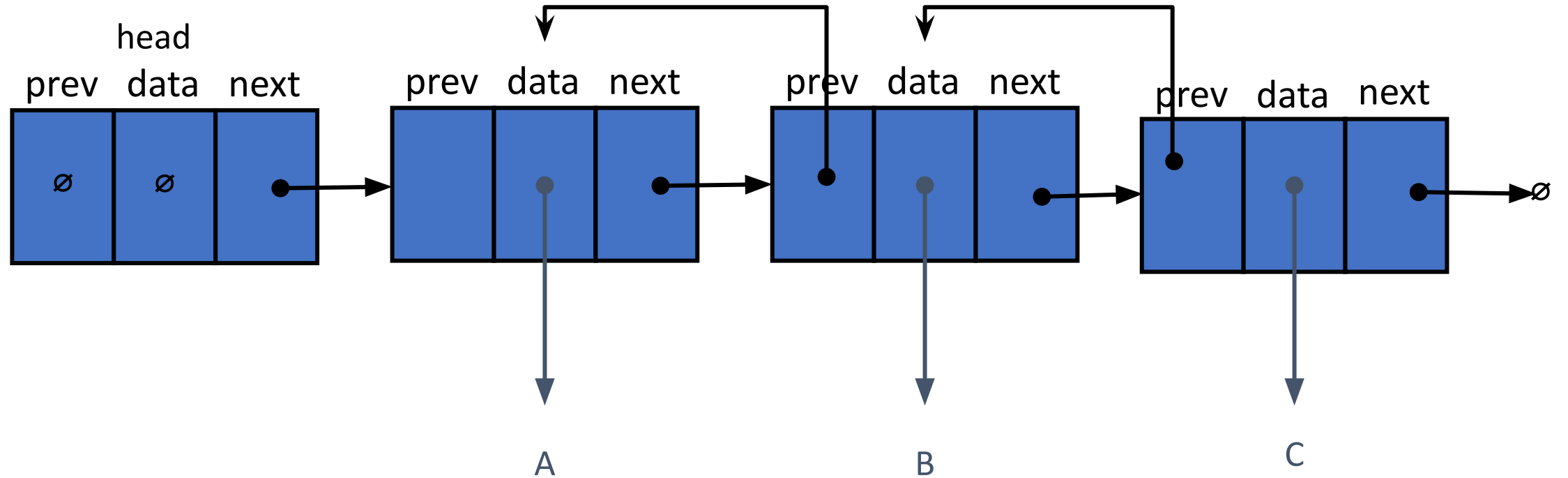
Doubly Linked Lists

A node

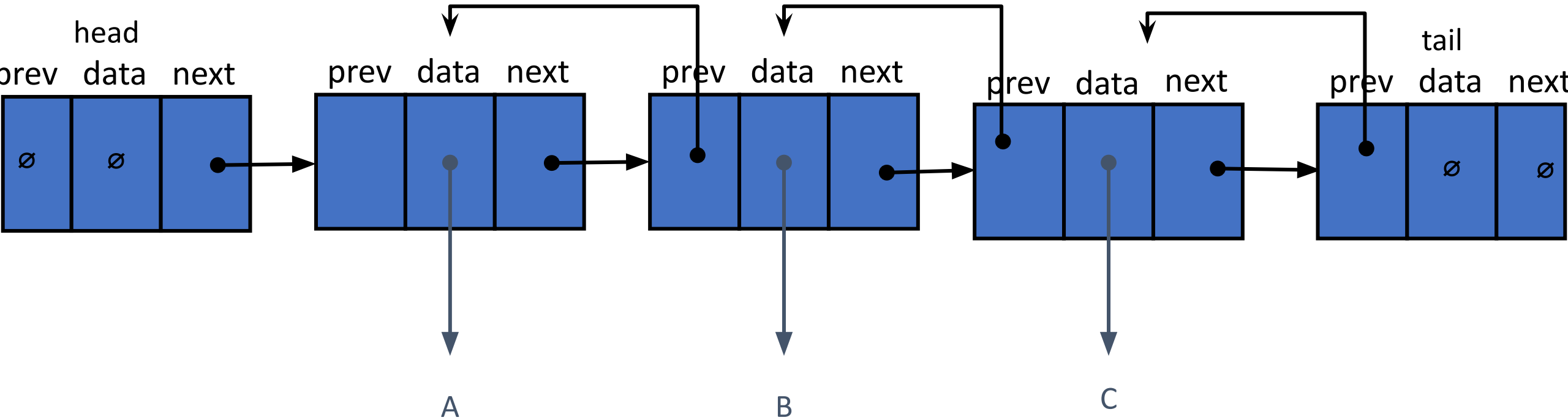
```
public class Node<T> {  
    private T data;  
    private Node next;  
    private Node prev;  
}
```



Doubly Linked List



Doubly Linked List



Lab time!