CS151 Intro to Data Structures

Doubly LinkedLists

Announcements

- HW01 due Friday
- lab today will be on singly linked lists and doubly linked lists

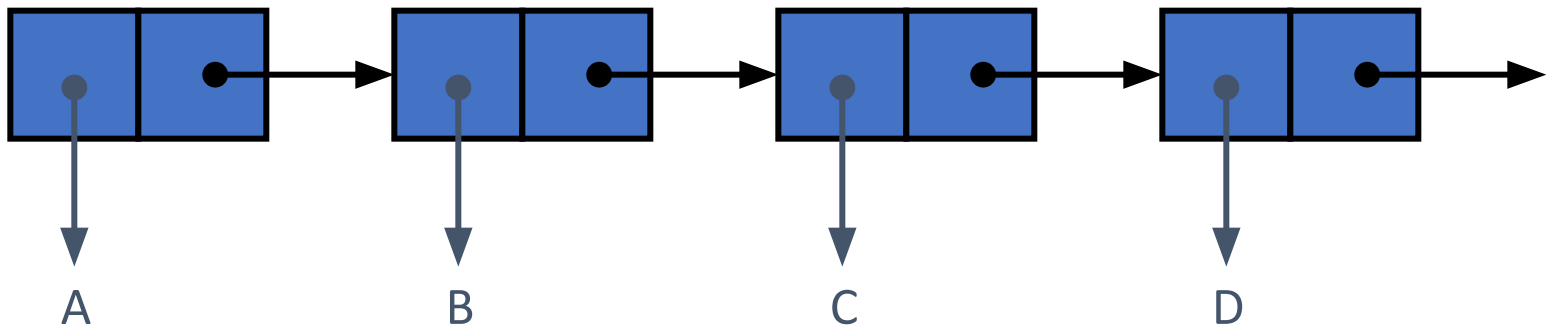
Outline

- LinkedLists review
- Fancy LinkedLists (Doubly Linked Lists)

Linked List

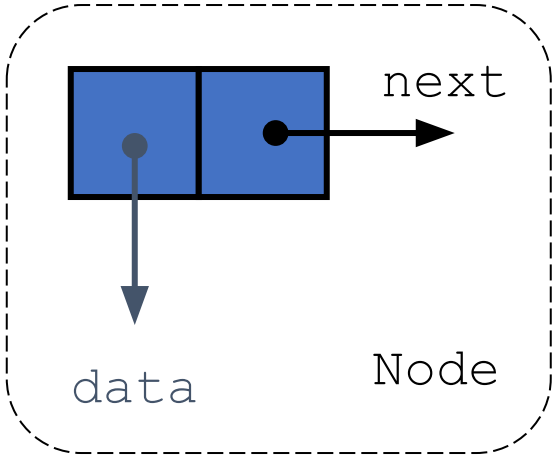
Linked List

- 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

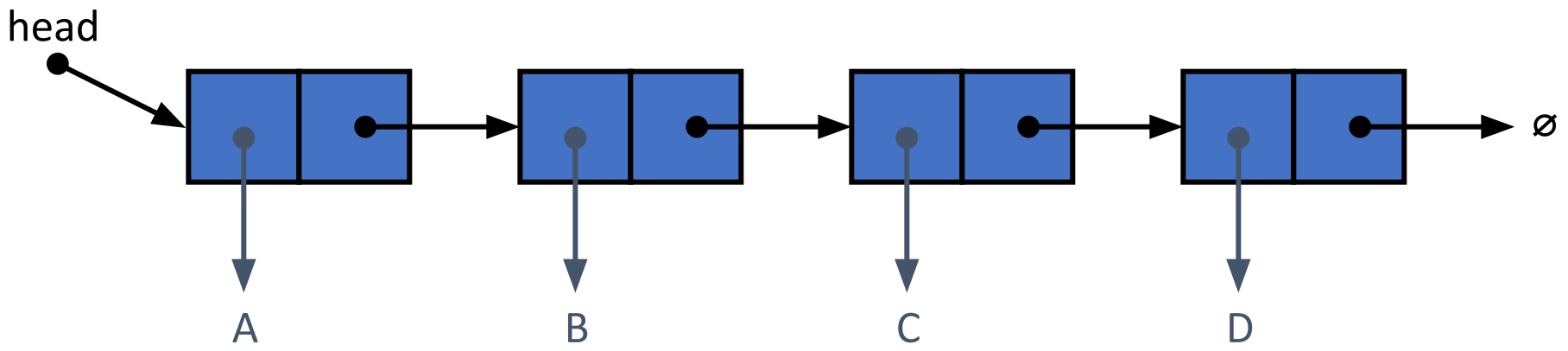
```
public class Node<T> {
   private T data;
   private Node next;
}
```



Linked List

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

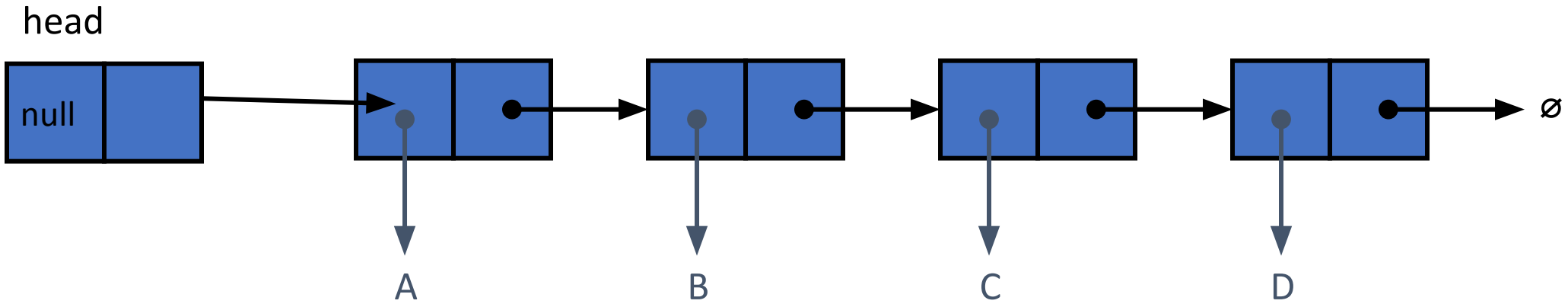
```
public class Node<T> {
  private T data;
  private Node next;
}
```



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

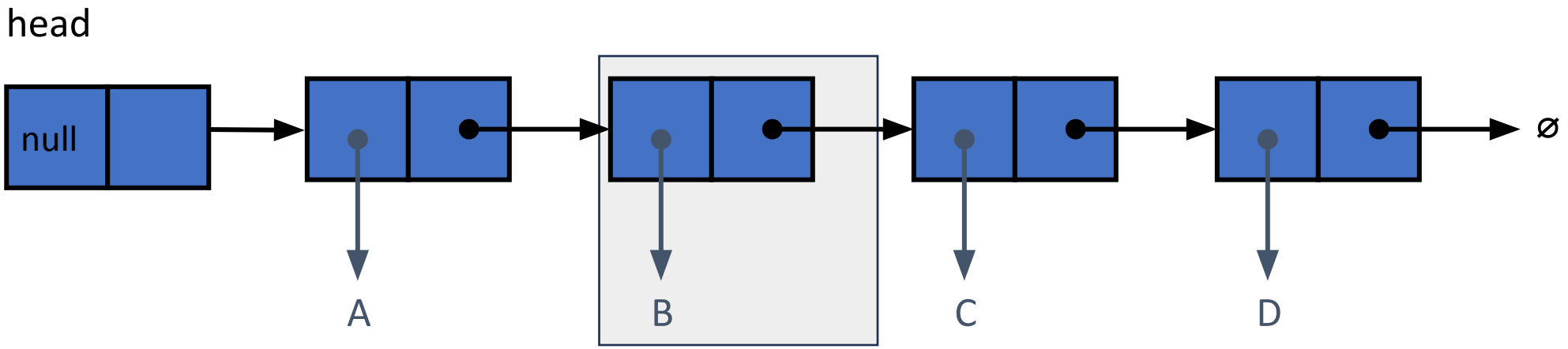
Access Operation

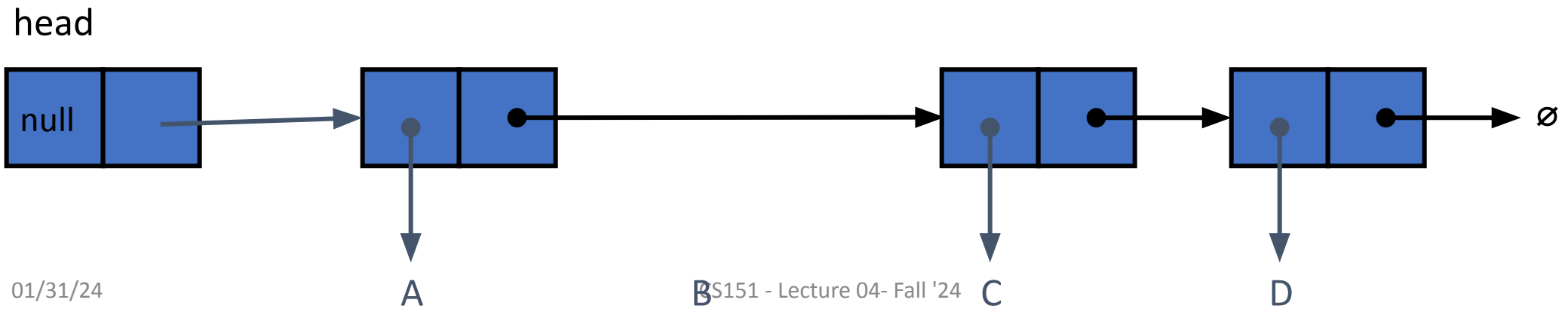
- Computational Complexity?
  - O(n)

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")`

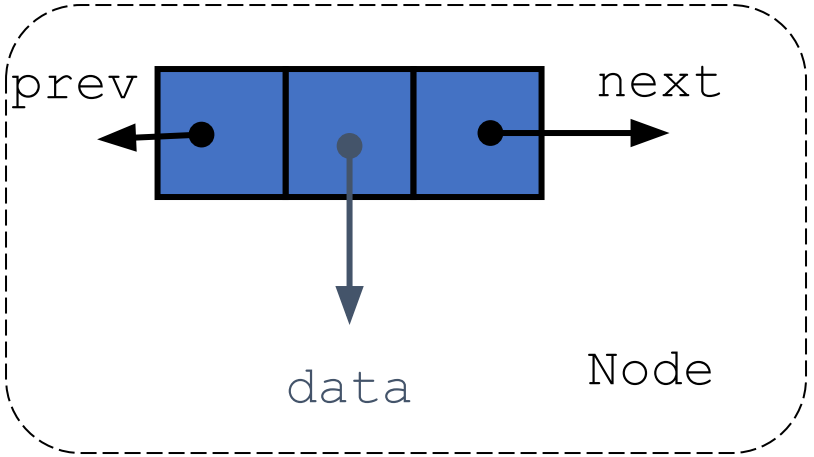




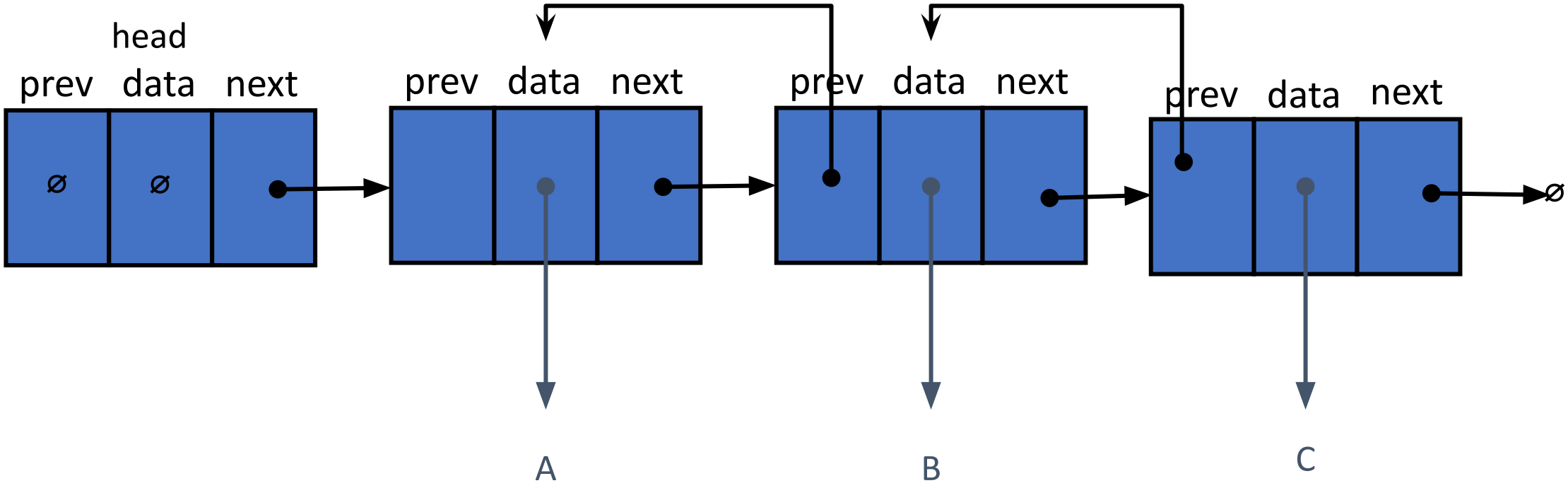
Doubly Linked Lists

A node

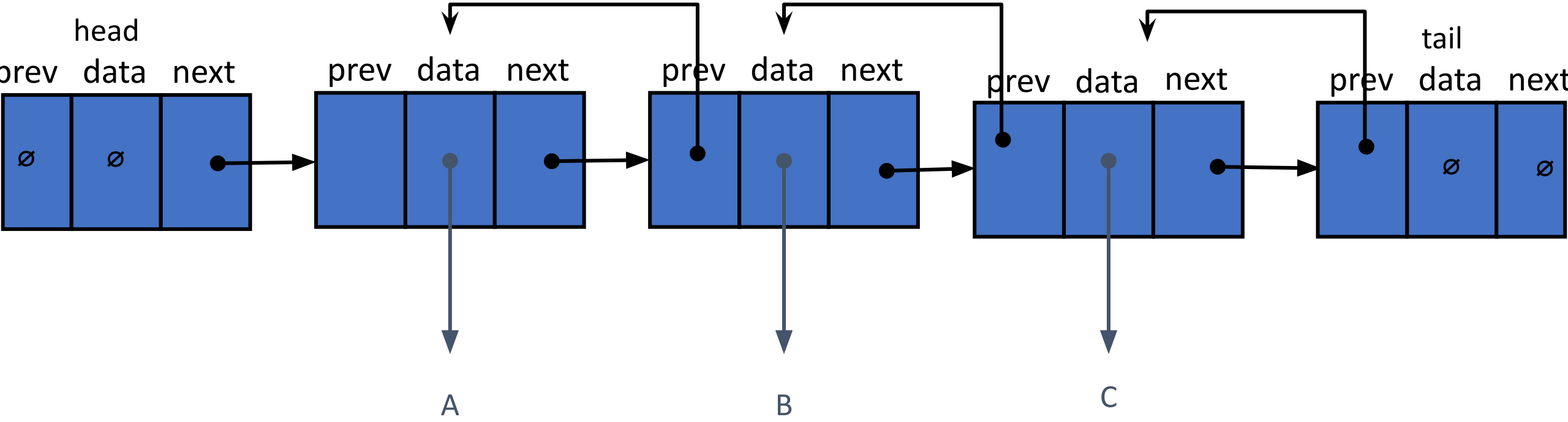
```
public class Node<T> {
   private T data;
   private Node next;
   private Node prev;
}
```



Doubly Linked List



Doubly Linked List



Lab time!

String compareTo