

ZAMAN UNIVERSITY

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Data Structures and Algorithms

Chapter 2

Abstract Data Types

Outline

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- Stacks
- Queues and Priority Queues
- Linked Lists
- Abstract Data Types
- Specialized Lists

Outline

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- Stacks
- Queues and Priority Queues
- Linked Lists
- Abstract Data Types
- **Specialized Lists**

Doubly Linked Lists

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- In a doubly linked list, each link contains a pointer to the **previous link** as well as to the **next link**.
- Why do we need this added pointer in each link?
 - A potential problem with ordinary singly linked lists is that it's difficult to traverse backward along the list.
 - Consider the following statement:

`pCurrent = pCurrent->pNext;`

Suppose, we want to delete a link at tail. Thus, we will execute the above statement until `pCurrent->pNext` equal NULL.

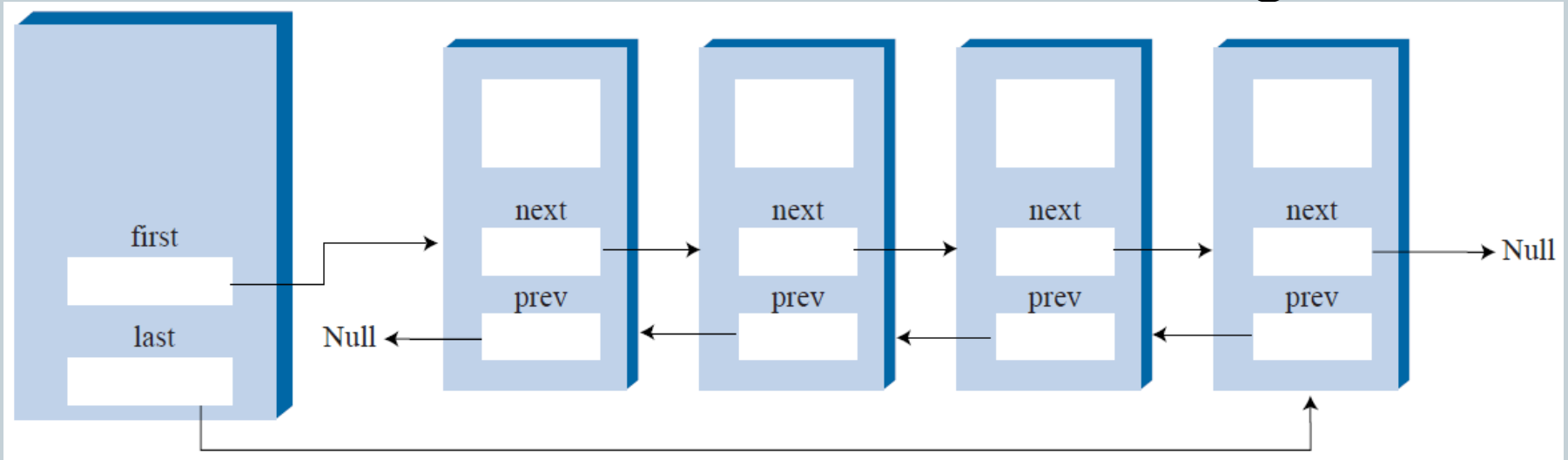
Then we arrived tail, before removing we should set `pNext` of a link before tail, equal to NULL.

In this case, we cannot move back to a link before tail.

Doubly Linked List

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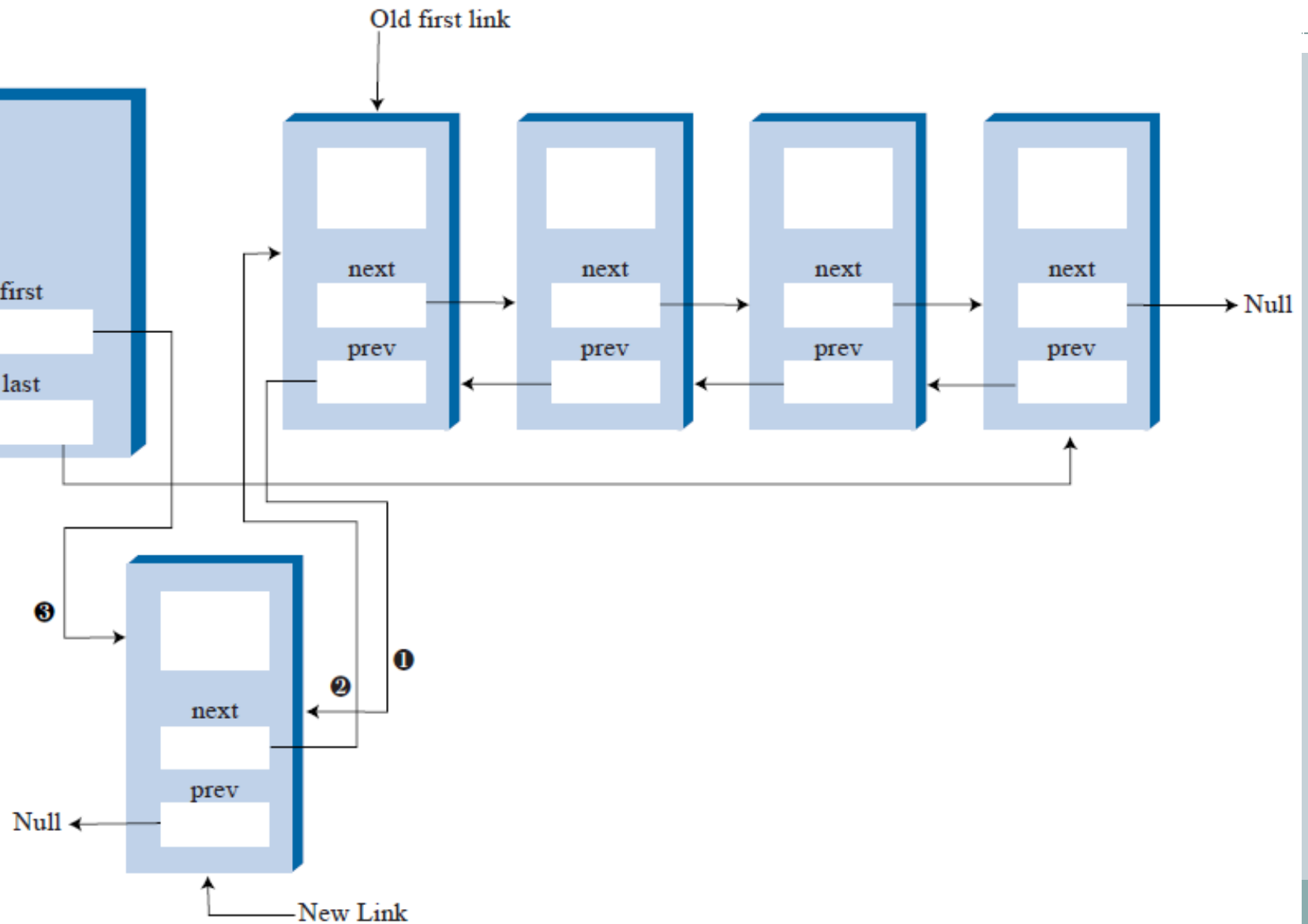
- The doubly linked list provides the capability to traverse backward as well as forward through the list.



```
class Link{
public:
    int intiData; //Data Item

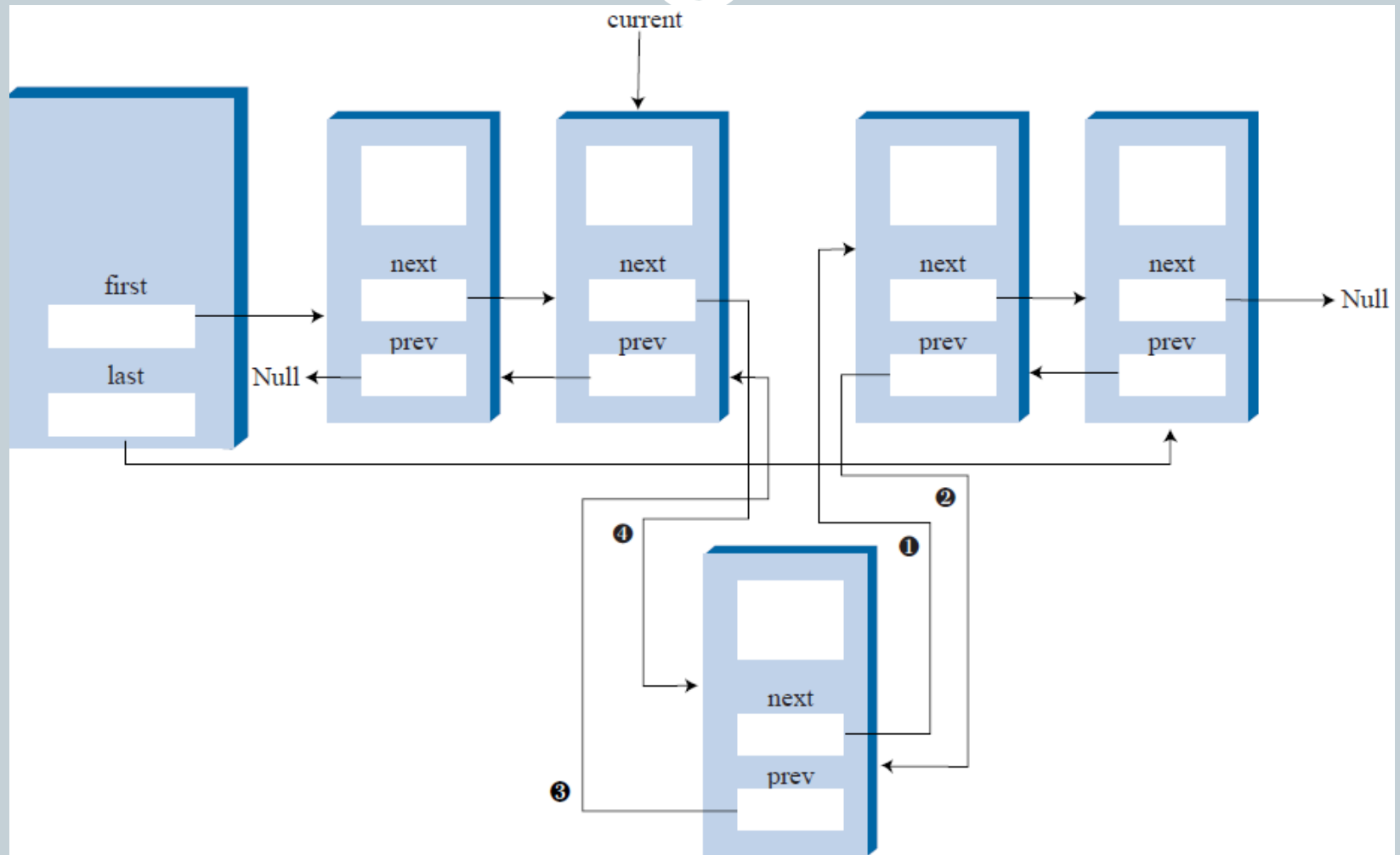
    Link* pNext; //Pointer to the next link in list
    Link* pPrevious; //Pointer to the previous link in list
};
```

Inserting New Links

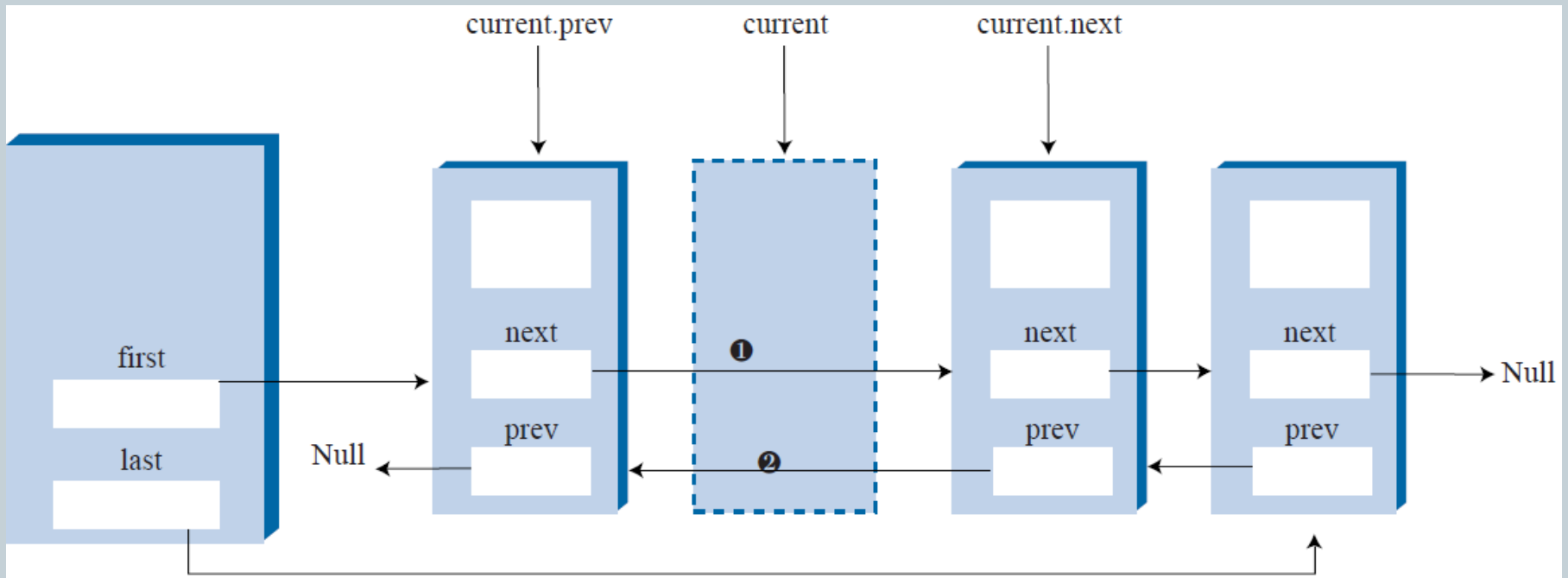


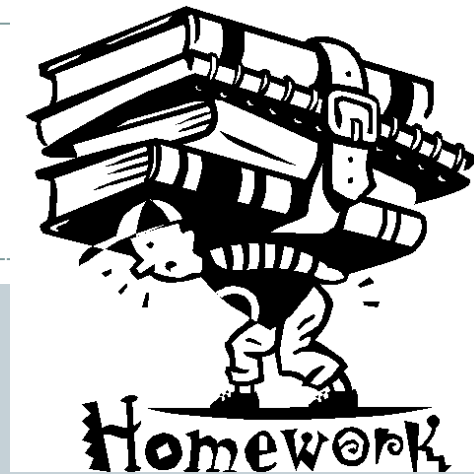
Insertion a Link at a Position

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Create Double Linked List with the following operations:

- `int` Size() - Return number of links in the linked list
- `void` InsertFirst(`int` Data) - Create a new link with Data, and insert it to the first
- `void` InsertInThePosition(`int` Data, `int` Pos) - Create a new link with Data, and insert it to the position Pos
- `void` InsertTail(`int` Data) - Create new link with Data, and insert the new list the tail of list
- `void` RemoveFirst() - Remove the first link from linked list
- `void` RemoveLinkInPosition(`int` Pos)- Remove a link in the position Pos
- `void` RemoveTail() - remove a link at the tail of list
- `bool` IsEmpty() - return ture - empty, else false

End of Chapter 2