

List Operations

15-111

Advanced Programming

Ananda Gunawardena

Advantages of Linked Lists

- The advantages of linked lists include:
 - Overflow can never occur unless the memory is actually full.
 - Insertions and deletions are *easier* than for contiguous (array) lists.
 - With large records, moving pointers is easier and faster than moving the items themselves.

Disadvantage of Linked Lists

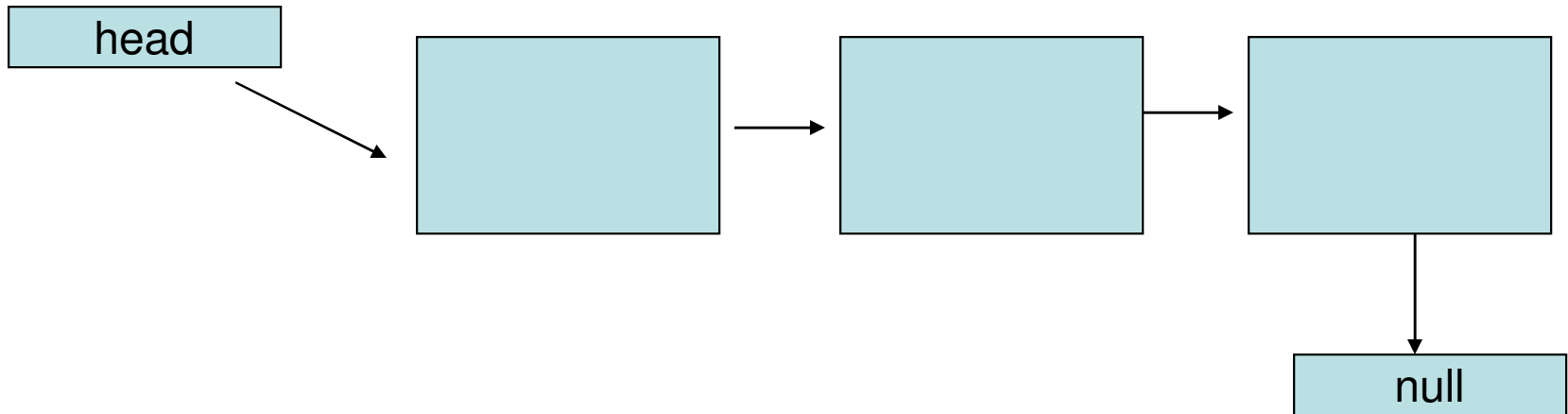
- The disadvantages of linked lists include:
 - The pointers require extra space.
 - Linked lists do not allow random access.
 - Time must be spent traversing and changing the pointers.
 - Programming is typically trickier with pointers.

Linked List Operations

List Operations

- Basic Operations on a Linked List are
 - Insertion
 - Deletion
- Other operations include
 - build list
 - Append and prepend (special cases of insert)
 - empty
 - length
 - toString
 - traversing

List Traversal



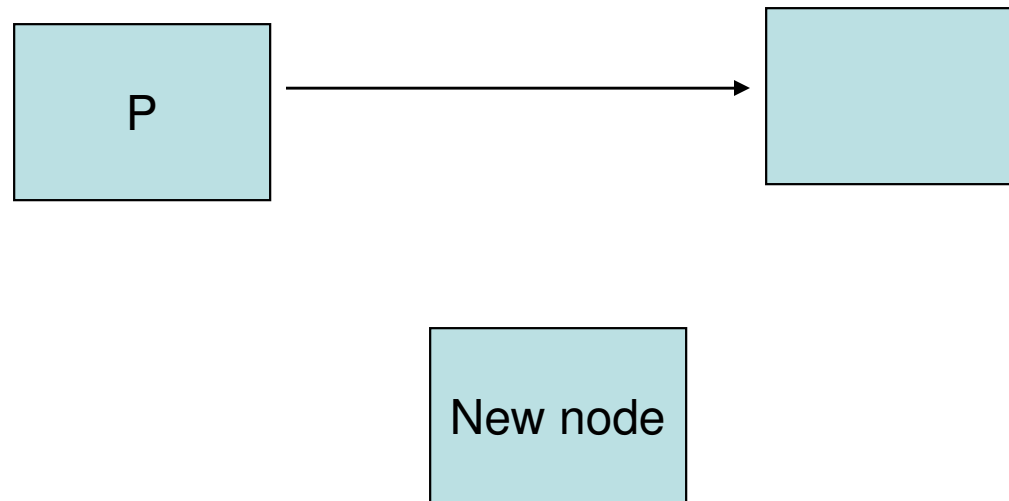
Insertion

- Two cases to consider
 - List is empty
 - Insert to the beginning of the list
 - List is non-empty
 - Locate the place to insert
 - Manipulate the references to make new links

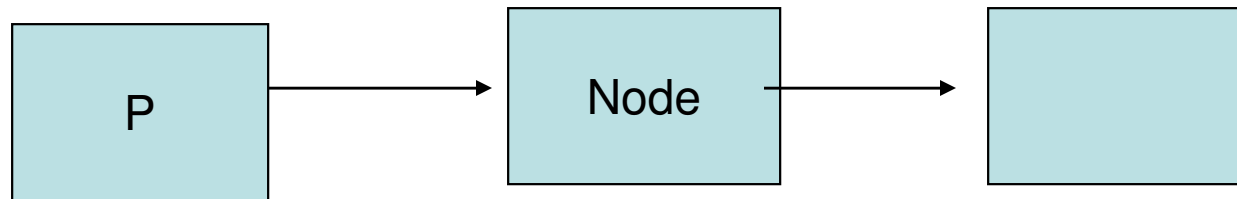
head



Insert Operation

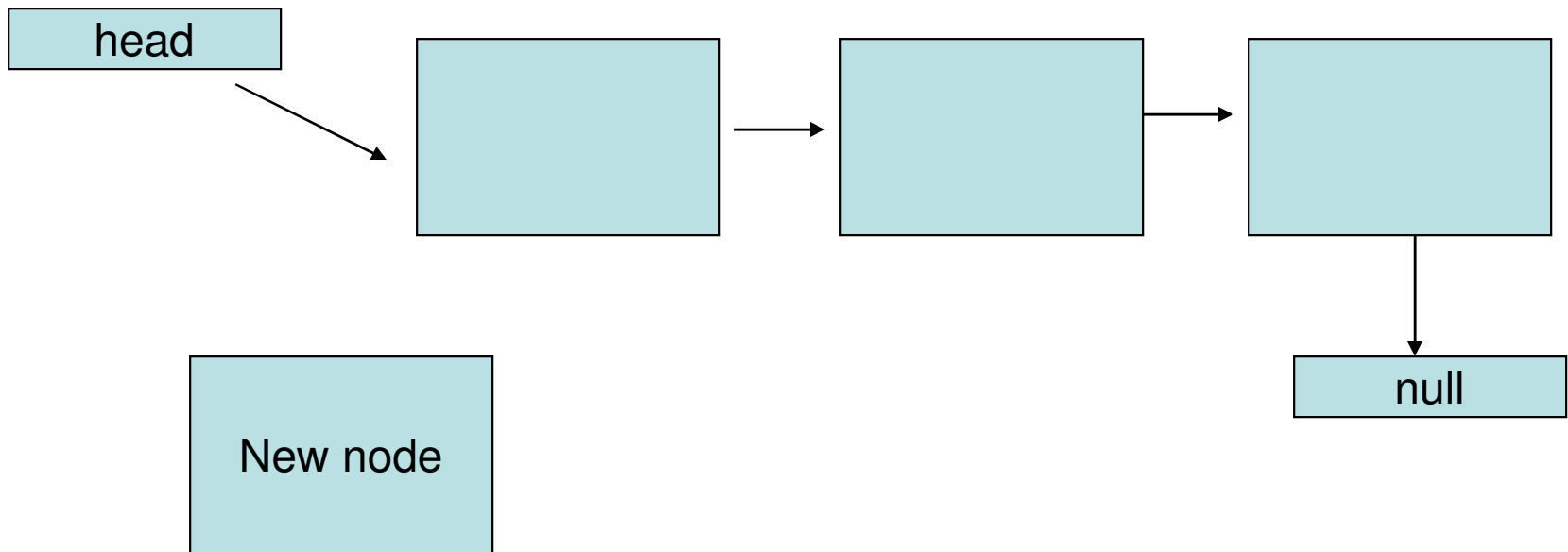


Delete Operation

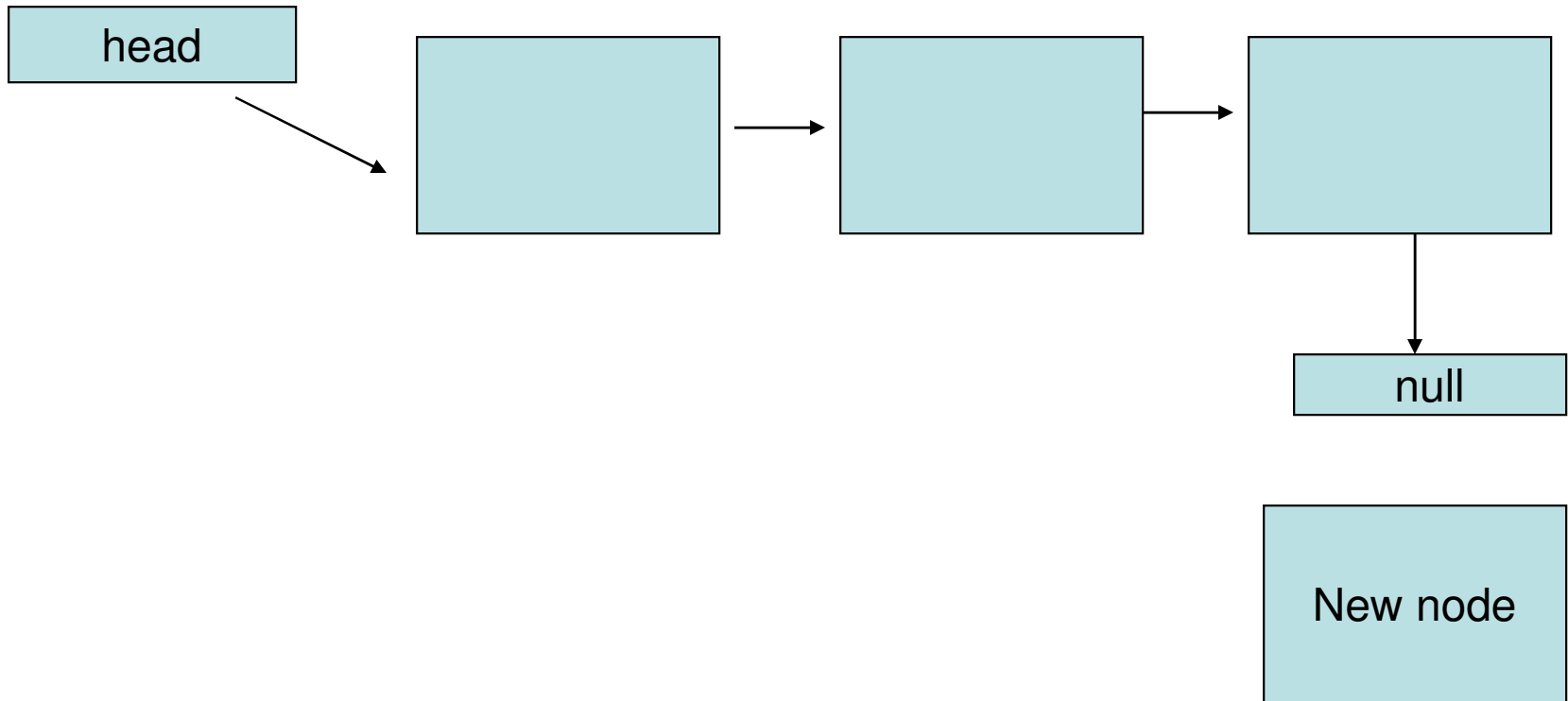


Other Operations

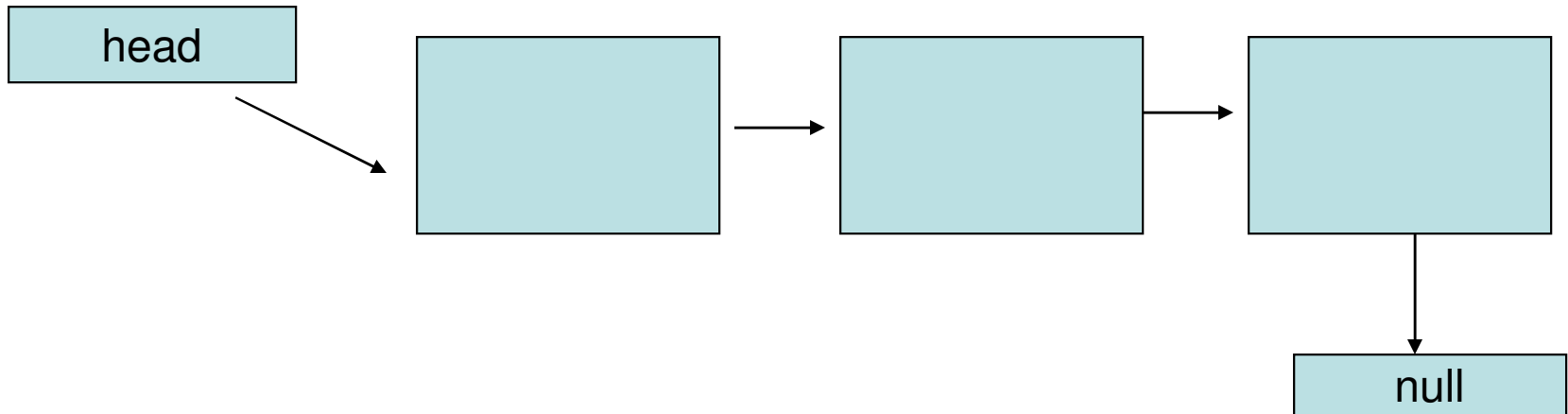
Prepend



Append



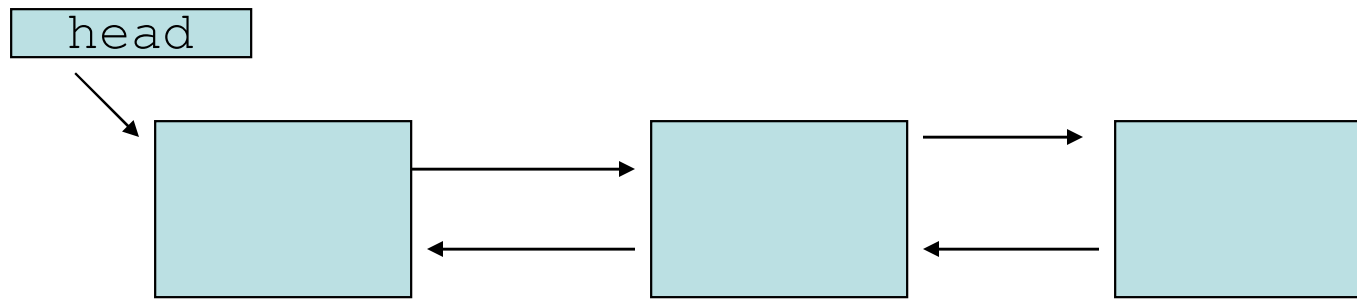
Length



List Types

Doubly Linked Lists

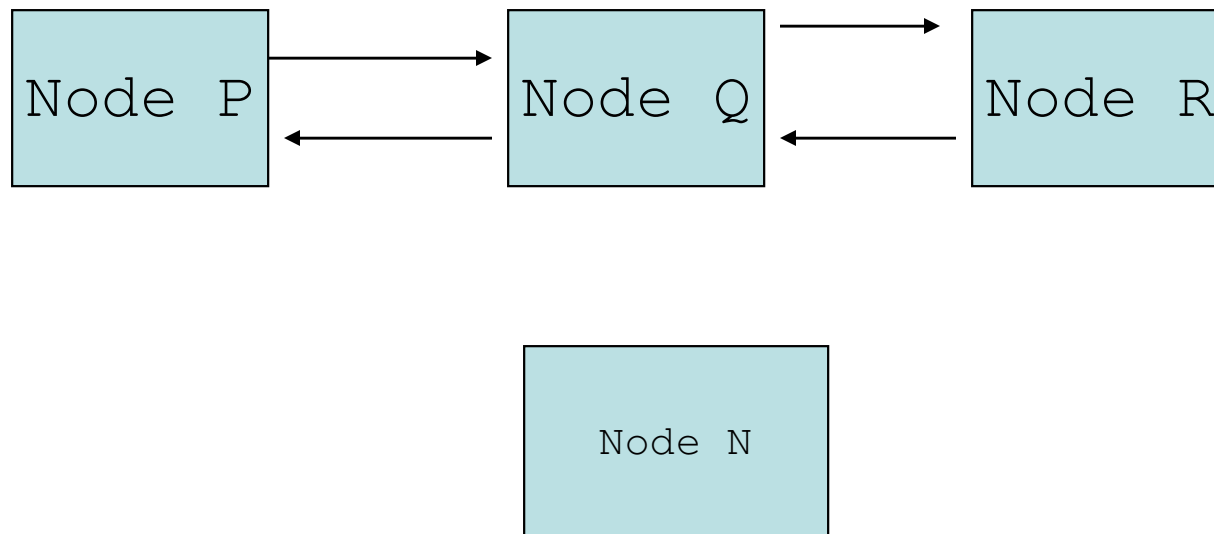
- Typically a linked list with two pointers (next and previous) is called a doubly linked list



```
class Node {  
    Object data;  
    Node next;  
    Node previous;  
    .....  
}
```

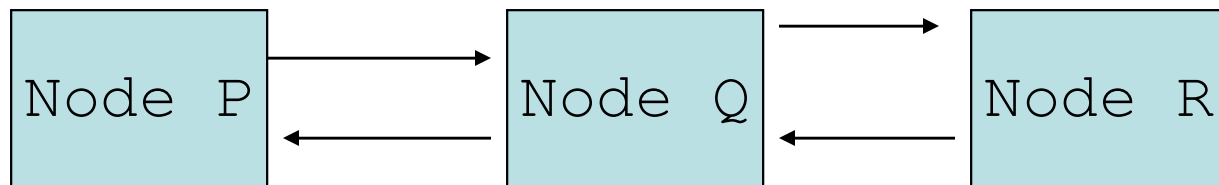
Inserting into a Doubly Linked List

- We have to manipulate both next and previous pointers. Insert new node N between P and Q



Deleting from a Doubly Linked List

- Write the code to delete Node Q



Building a Doubly Linked List

- Build a doubly linked list with 3 nodes (always insert to the front of the list)
- Node Head = new Node(new Integer(3), null, null);
- Node N = new Node(new Integer(4), null, null);
- Connect the two nodes

Make it a Circular Doubly Linked List

- Write the code to create a circular doubly linked list.

Multi Linked List - An Example

