DATA STRUCTURES AND ITS APPLICATIONS

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Circular Doubly Linked List

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Circular Doubly Linked List

Node Structure Definition

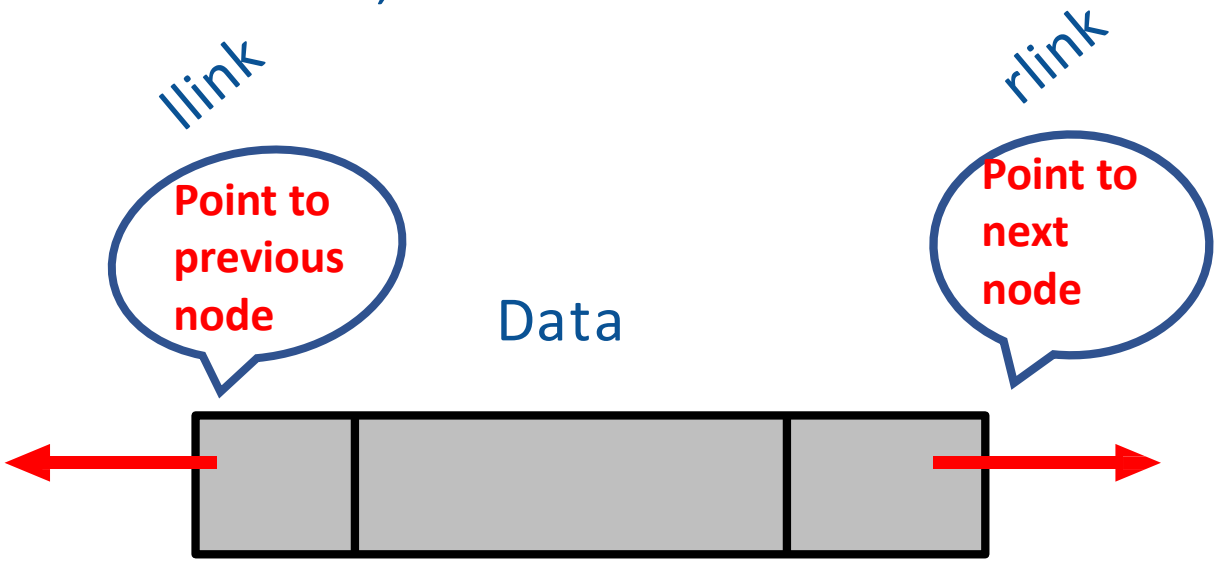
A doubly linked list node contain three fields:

- Data
- link to the next node
- link to the previous node.

Circular Doubly Linked List

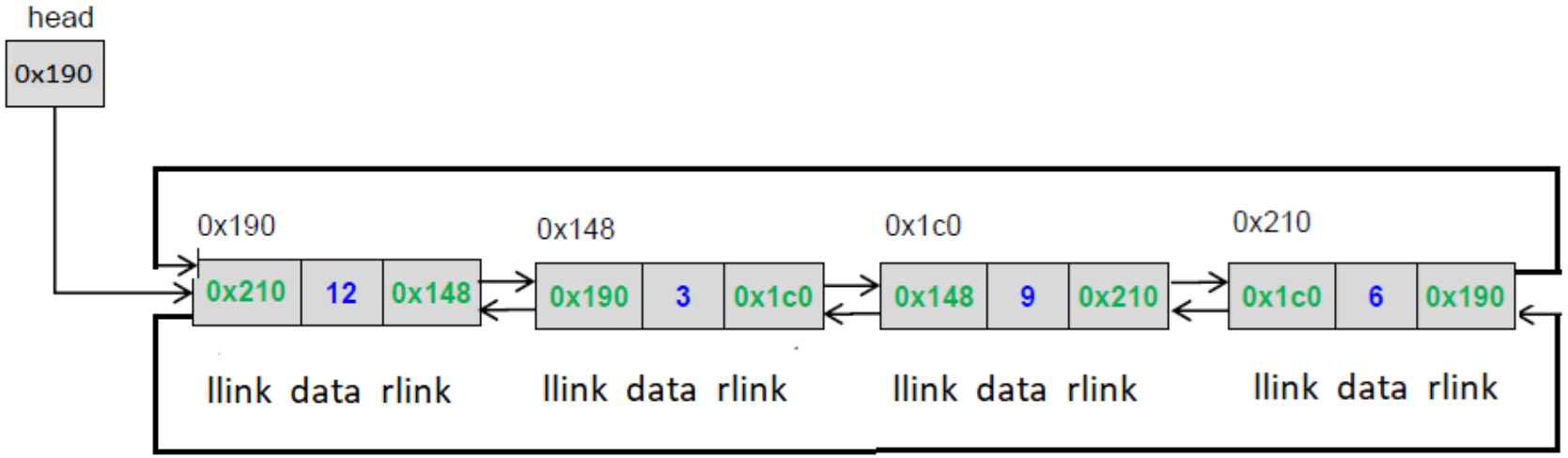
Node Structure Definition

```
struct node
{
   int data;
   struct node*llink;
   struct node*rlink;
};
```



DATA STRUCTURES AND ITS APPLICATIONS

Circular Doubly Linked List: Example



Creating a node

- Allocate memory for the node dynamically
- If the memory is allocated successfully
  - set the data part
  - set the llink and rlink to NULL

Inserting a node

There are 3 cases

- Insertion at the beginning
- Insertion at the end
- Insertion at a given position

Insertion at the beginning

What all will change

Case 1: linked list empty

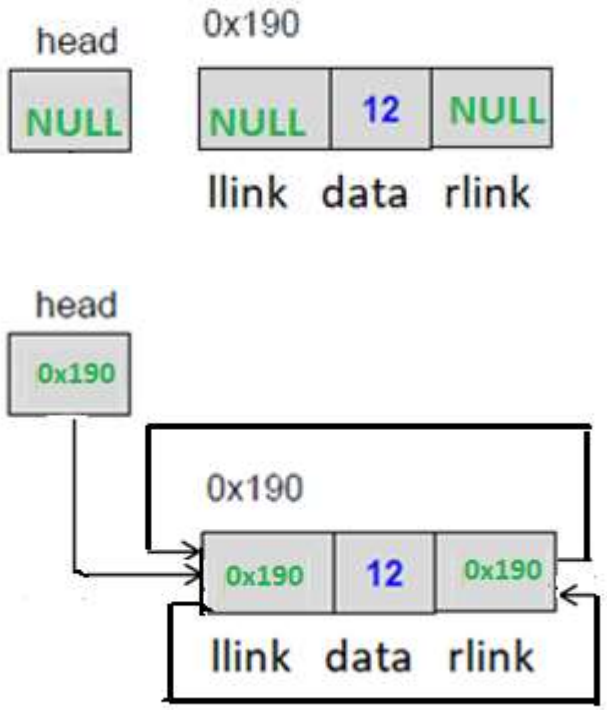
- Head pointer

Case 2: linked list is not empty

- Head pointer
- New front node's rlink and llink
- Old front node's llink
- Last node's rlink

Circular Doubly Linked List Operations

Insertion at the beginning (Case1)



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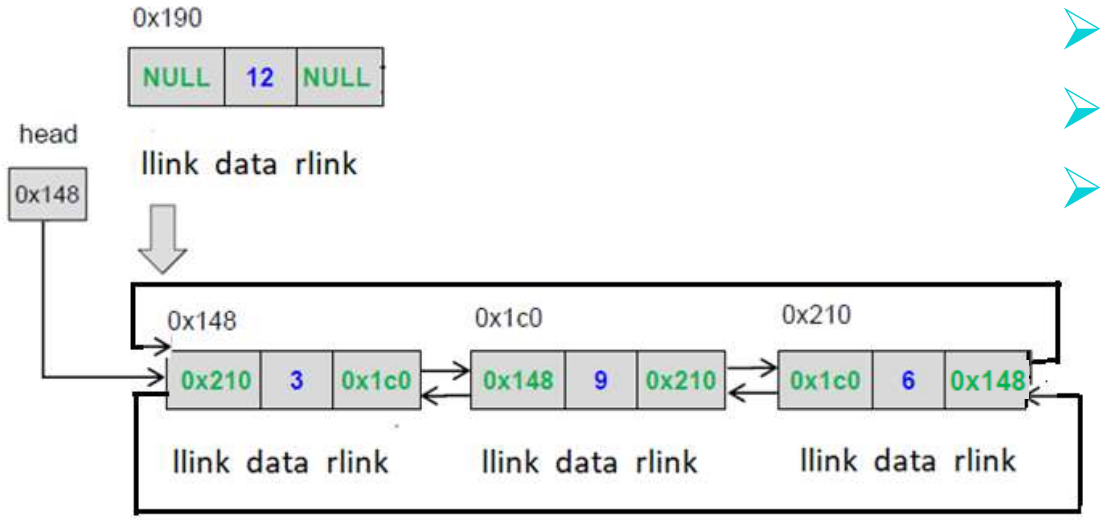
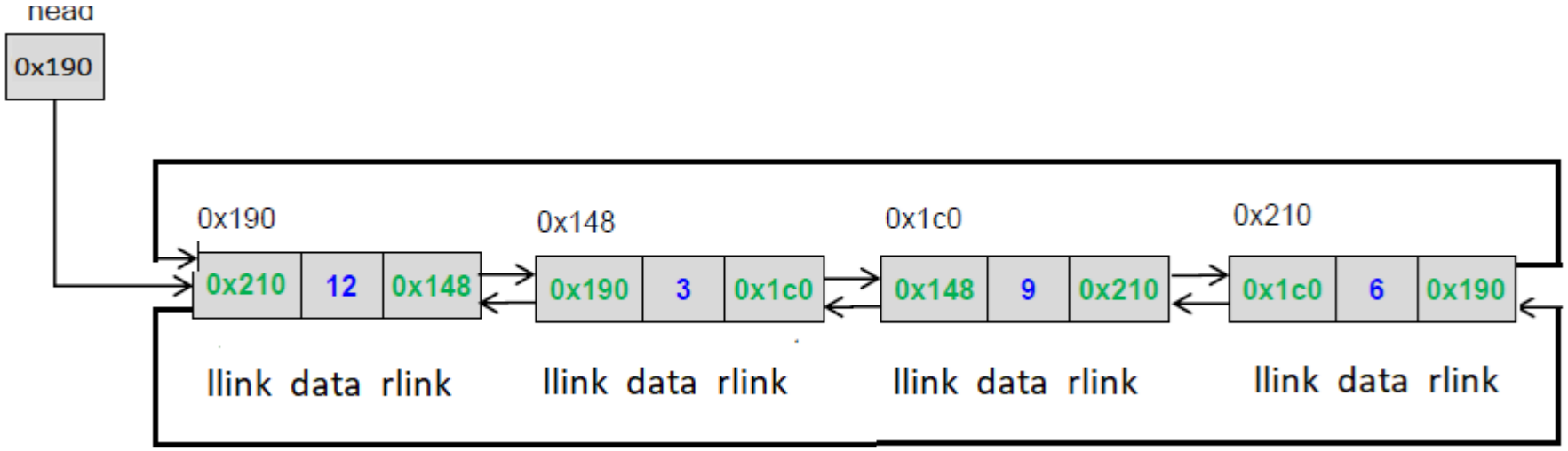
Circular Doubly Linked List Operations

Insertion at the beginning(Case 2)

- Head pointer
- New front node's rlink and llink
- Old front node's llink
- Last node's rlink





Insertion at the end

What all will change

Case 1: linked list empty

- Head pointer

Case 2: linked list is not empty else

- Last node's rlink
- First node llink
- New node's llink and rlink

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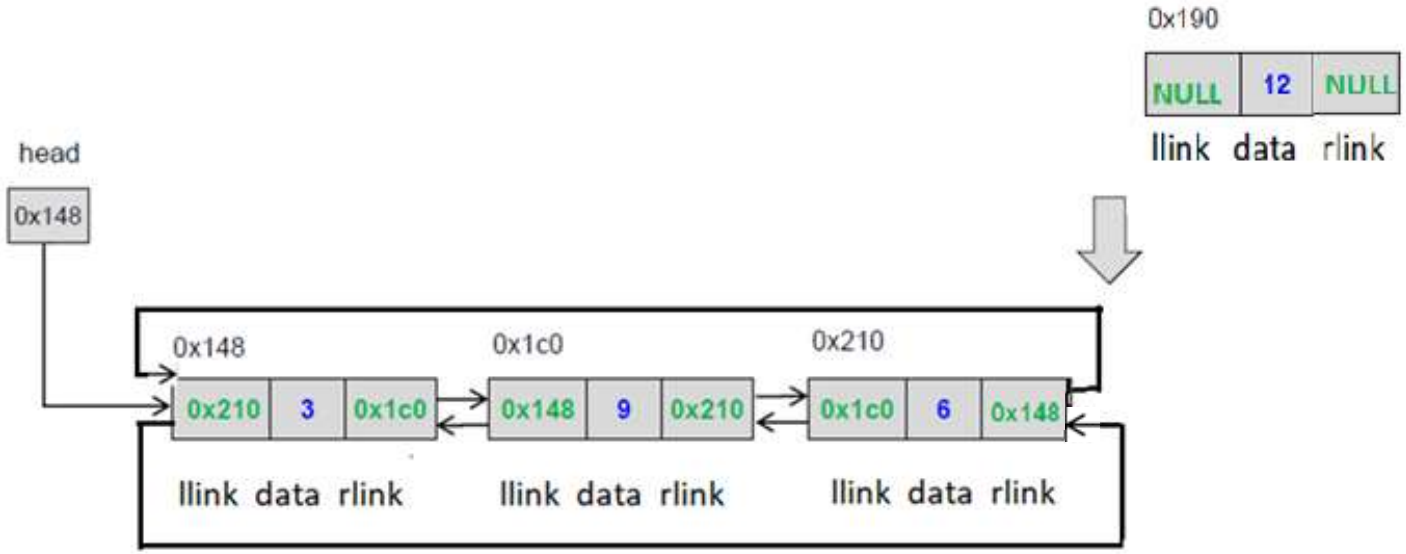
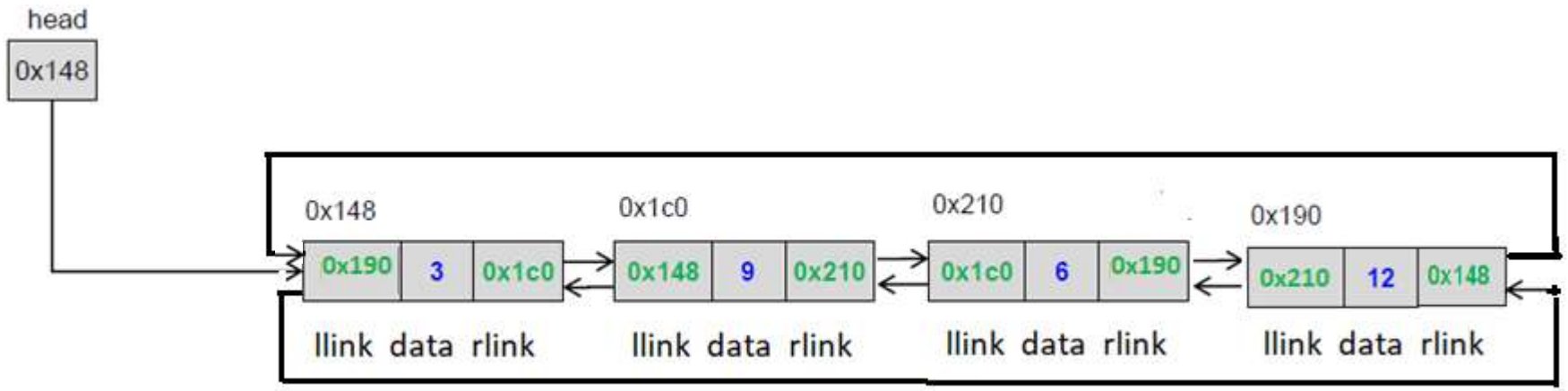
Circular Doubly Linked List Operations

Insertion at the end



node's rlink
: node llink
v node's llink and rlink



Circular Doubly Linked List Operations

Insertion at the given position

- Create a node

If the list is empty

- make the start pointer point towards the new node;

Else

if it is first position

- Insert at front

else

- Traverse the linked list to reach given position
- Keep track of the previous node

If it is valid position

intermediate position

- Change link fields of current previous and intermediate node

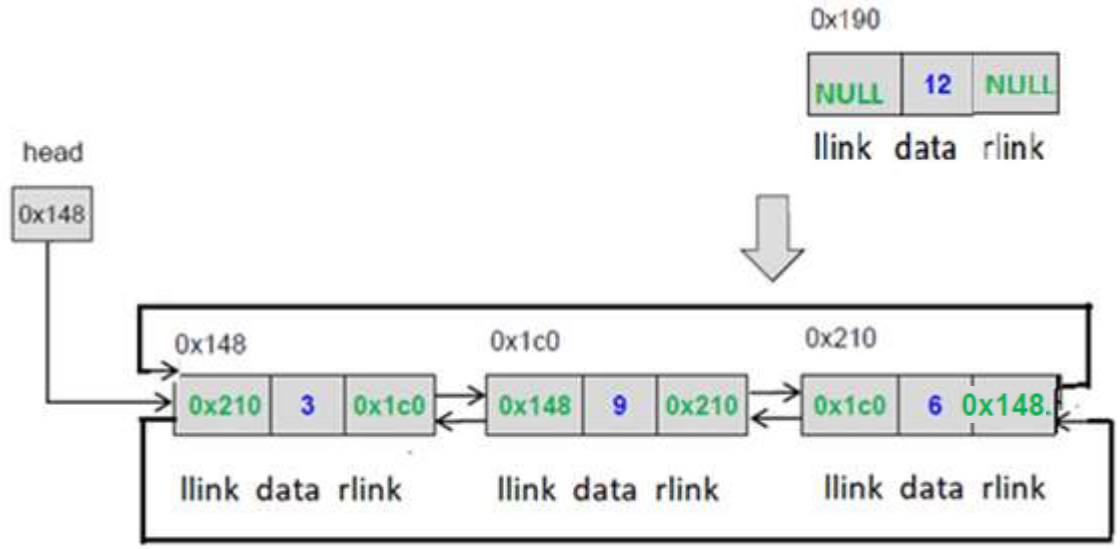
last position

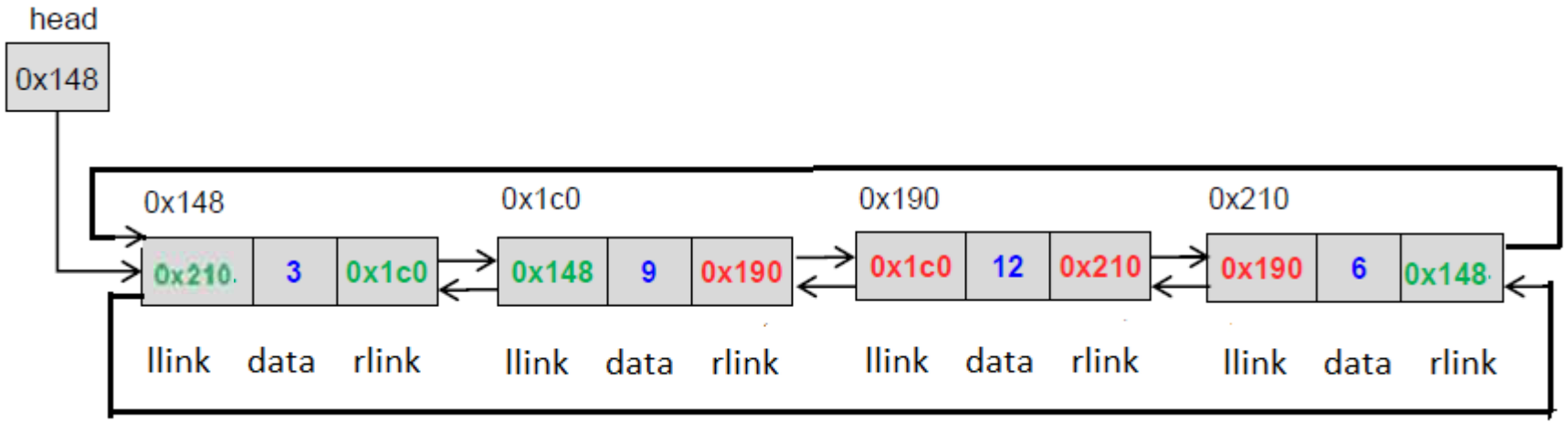
- insert at end

DATA STRUCTURES AND ITS APPLICATIONS

Circular Doubly Linked List Operations

Insertion at the given position





Deleting a node

There are 3 cases

- Deleting first node
- Deleting last node
- Deleting a node at a given position

Deleting a node

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- Deleting first node
- Deleting last node
- Deleting a node at a given position

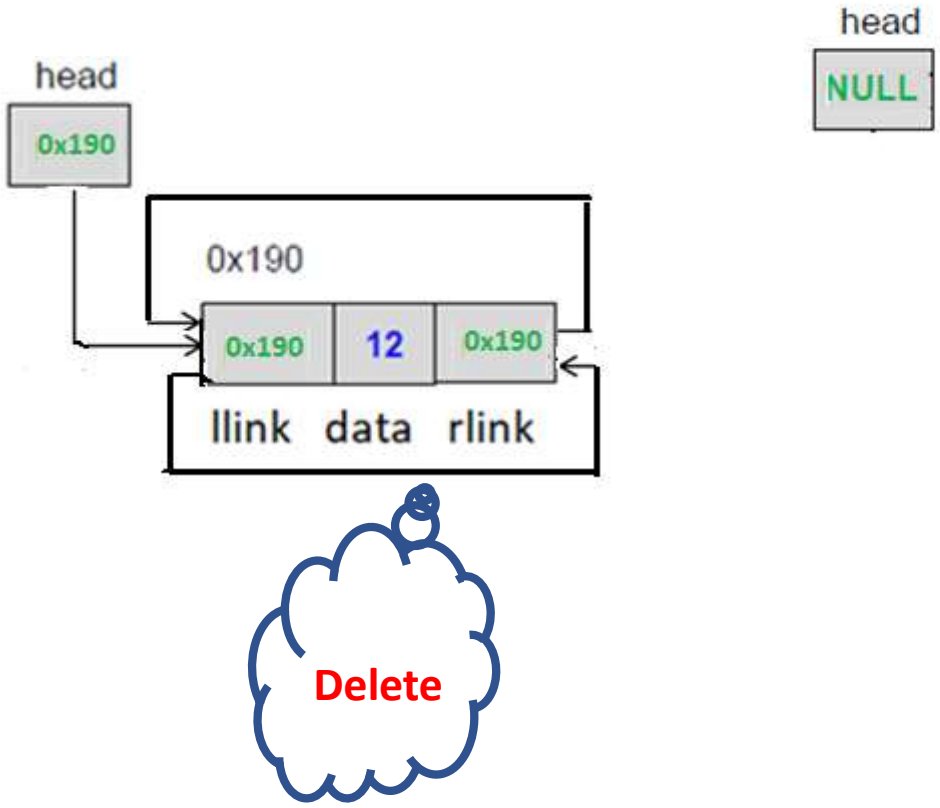
Deleting first node

What will change??

- Case I : Empty Linked List
- Case II : Linked list with a single node
  first node gets freed up
  head points to NULL
- Case III : Linked List with more than one node
  Second node llink
  last node rlink
  first node gets freed off
  head pointer points to second node

Deleting first node

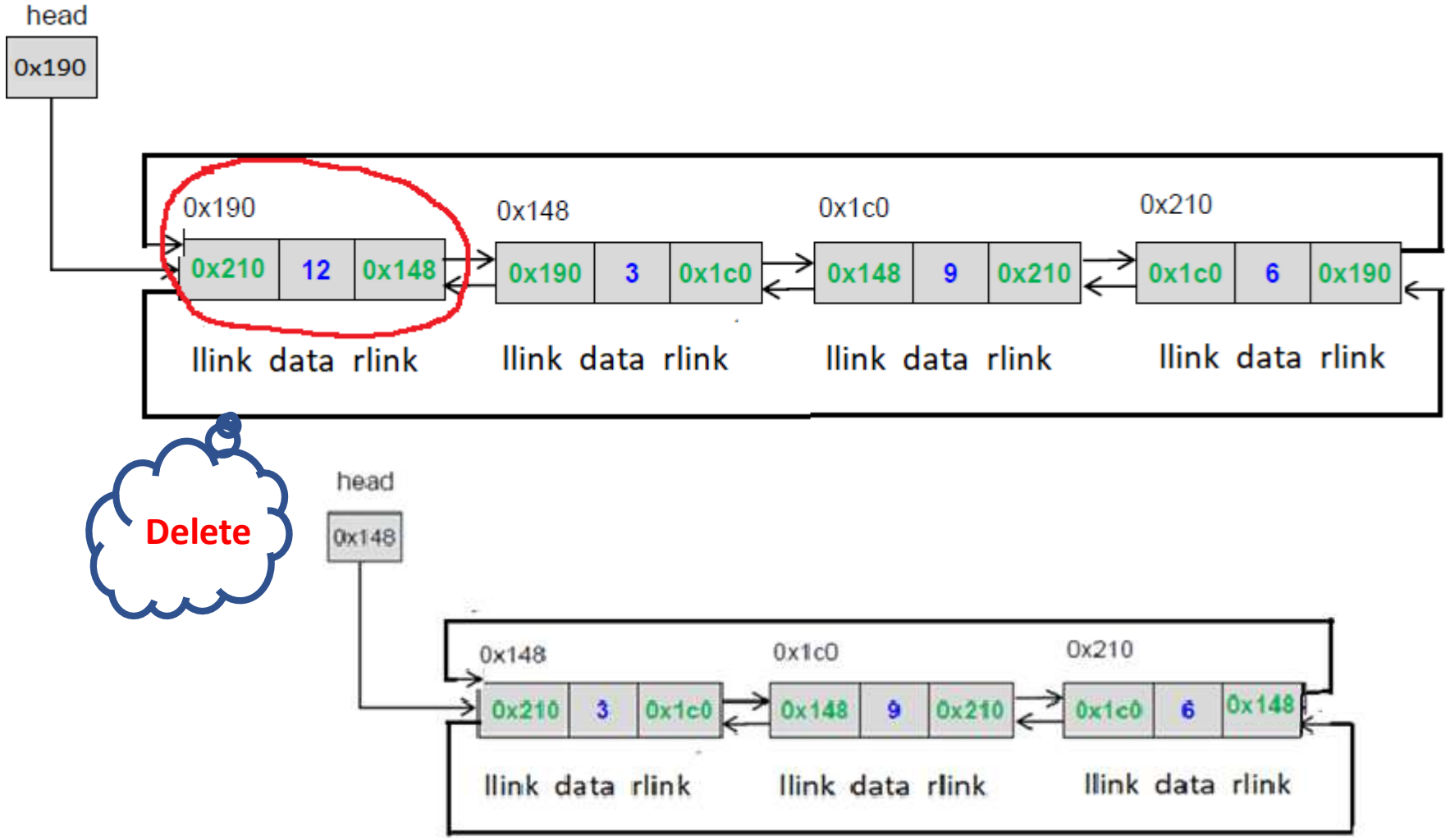
- Case II : Linked list with a single node



Circular Doubly Linked List Operations

Deleting first node

- Case III : Linked List with more than one node



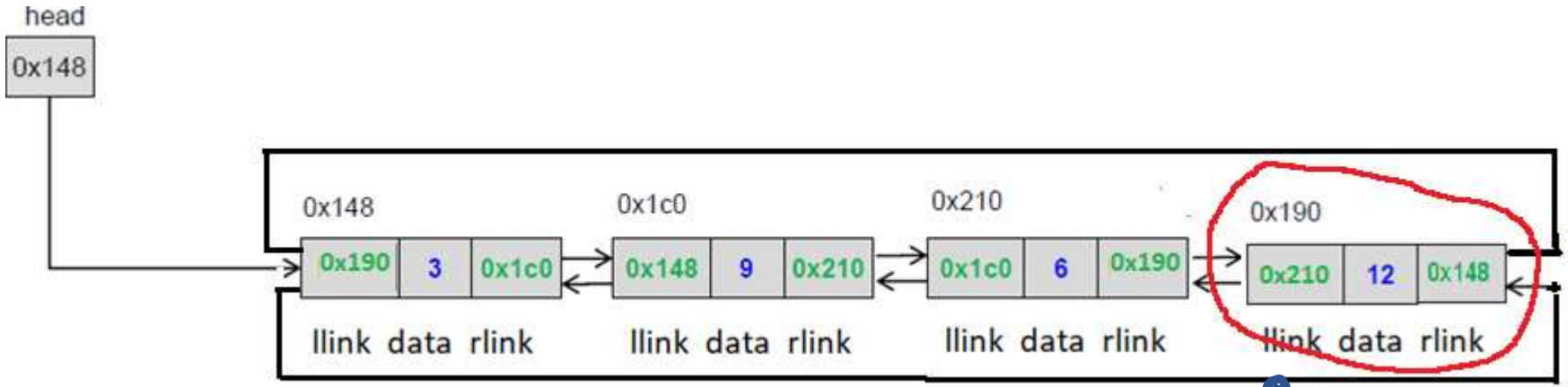
Deleting last node

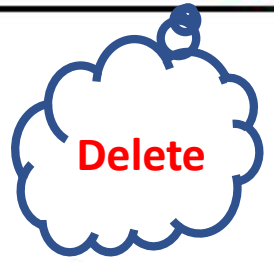
What will change??

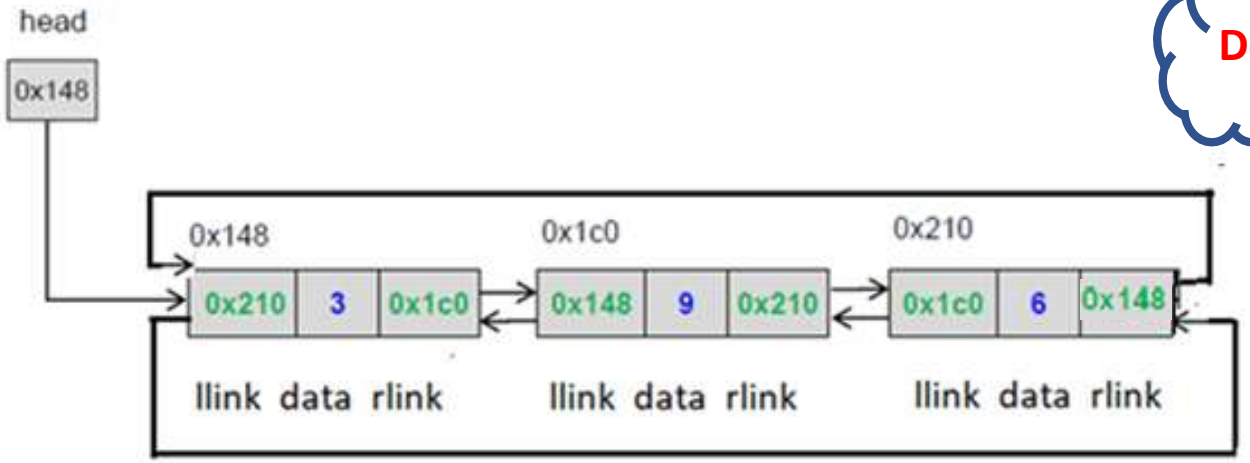
- Case I : Empty Linked List
- Case II : Linked list with a single node
  first node gets freed up
  head points to NULL
- Case III : Linked List with more than one node
  Second last node rlink
  first node llink
  last node gets freed up

Deleting last node

- Case II : Linked List with more than one node

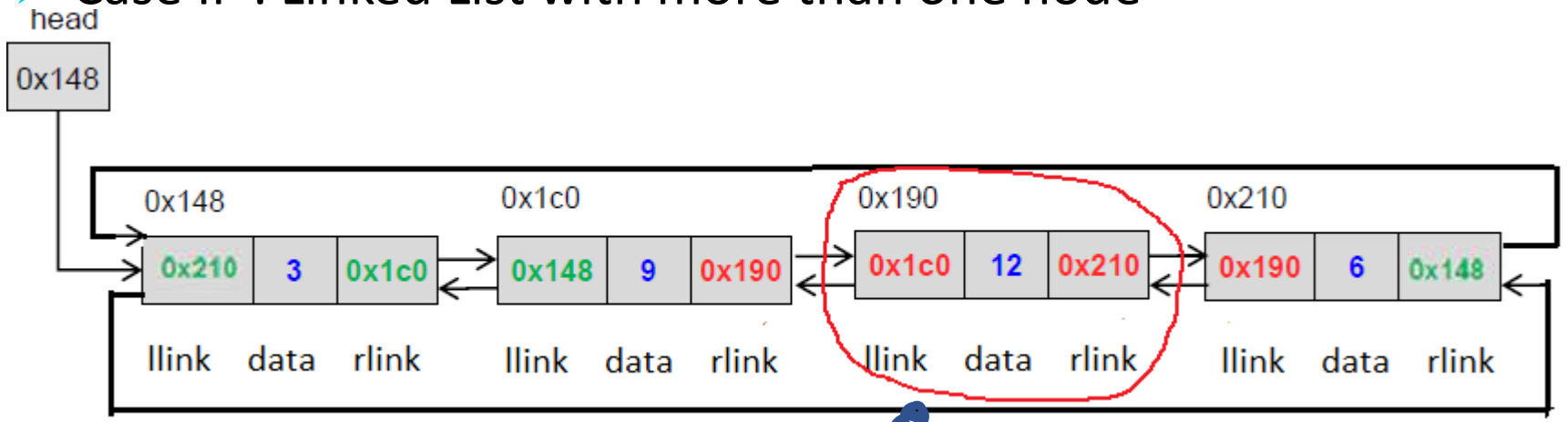




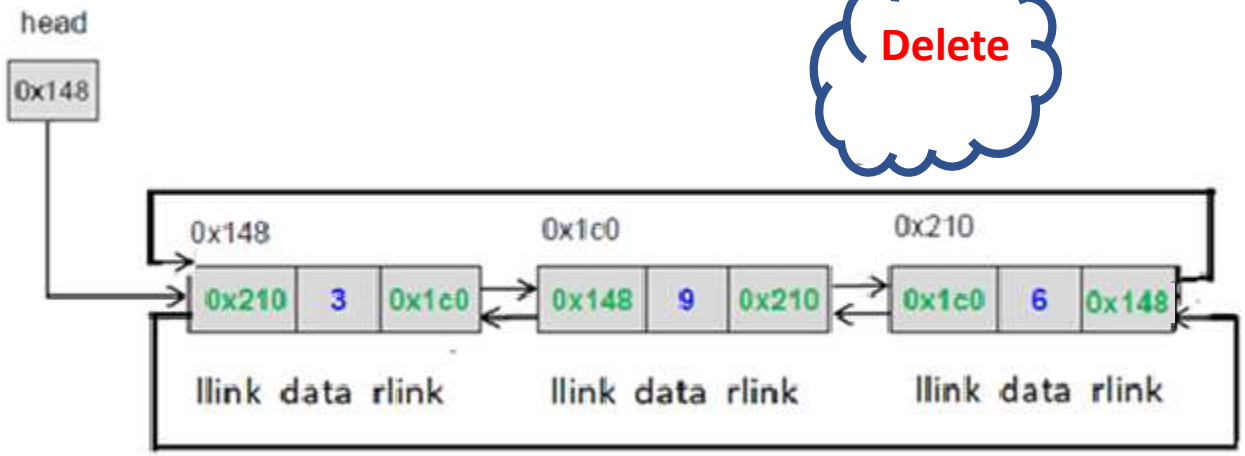


Deleting a node at intermediate position

- Case II : Linked List with more than one node



Delete



Circular doubly Linked List operations

Apply the concepts to implement following operations for a doubly circular linked list

- Reverse list using recursion
- Search given element in the list
- Find the largest value in the list

THANK YOU

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