TECHNO INDIA UNIVERSITY
WESTBENGAL

Data Structures & Algorithms
(PCC-CS 301)

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Topics Covered

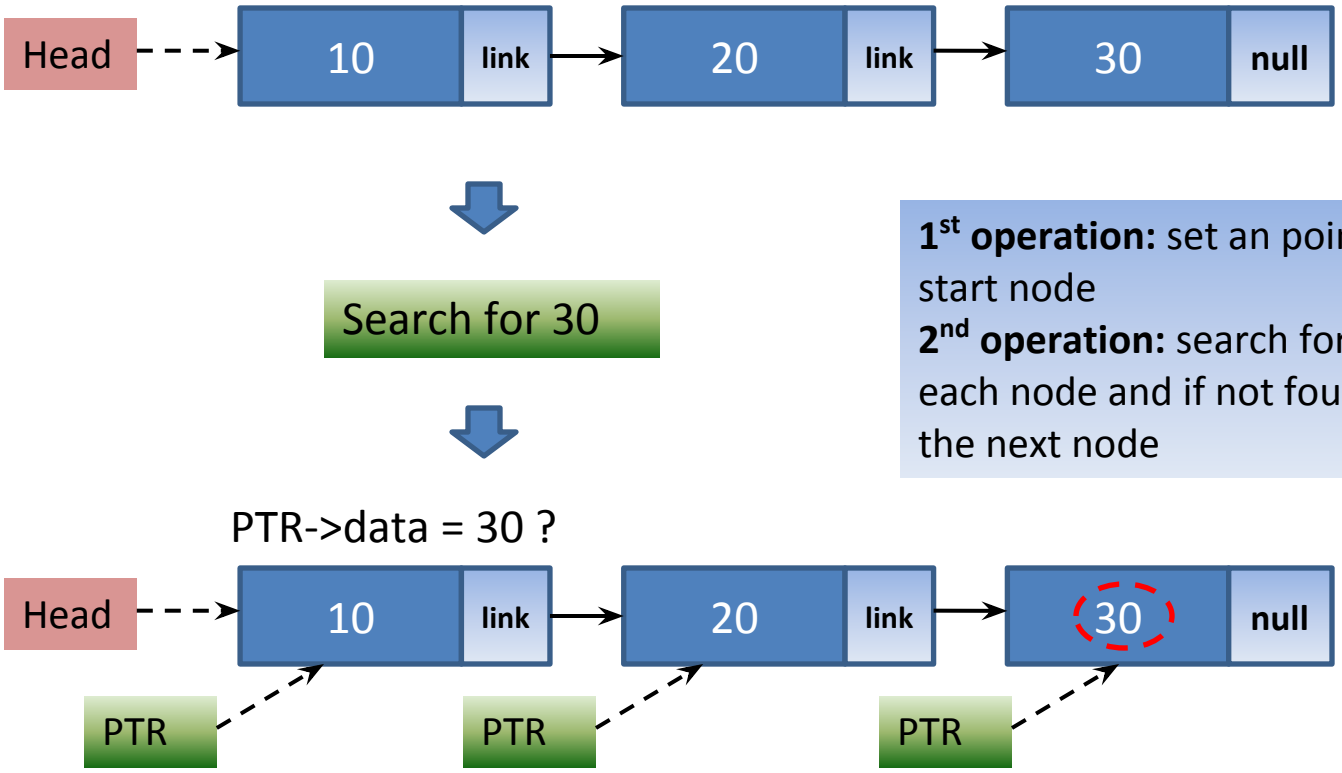
1. Singly Linked List
    a. Deletion
    b. Display
    c. Search
2. Circular Linked List
    a. Data insertion

Linked List

- Singly Linked List
  - Operations
    - Node deletion
      - Deletion of a given data along with declining the link
    - Display list
      - Printing all the data in the list
    - Node searching
      - Searching for a given data in the list
      - No modification on address field is required

Linked List

- Singly Linked List
  - Searching data in the list

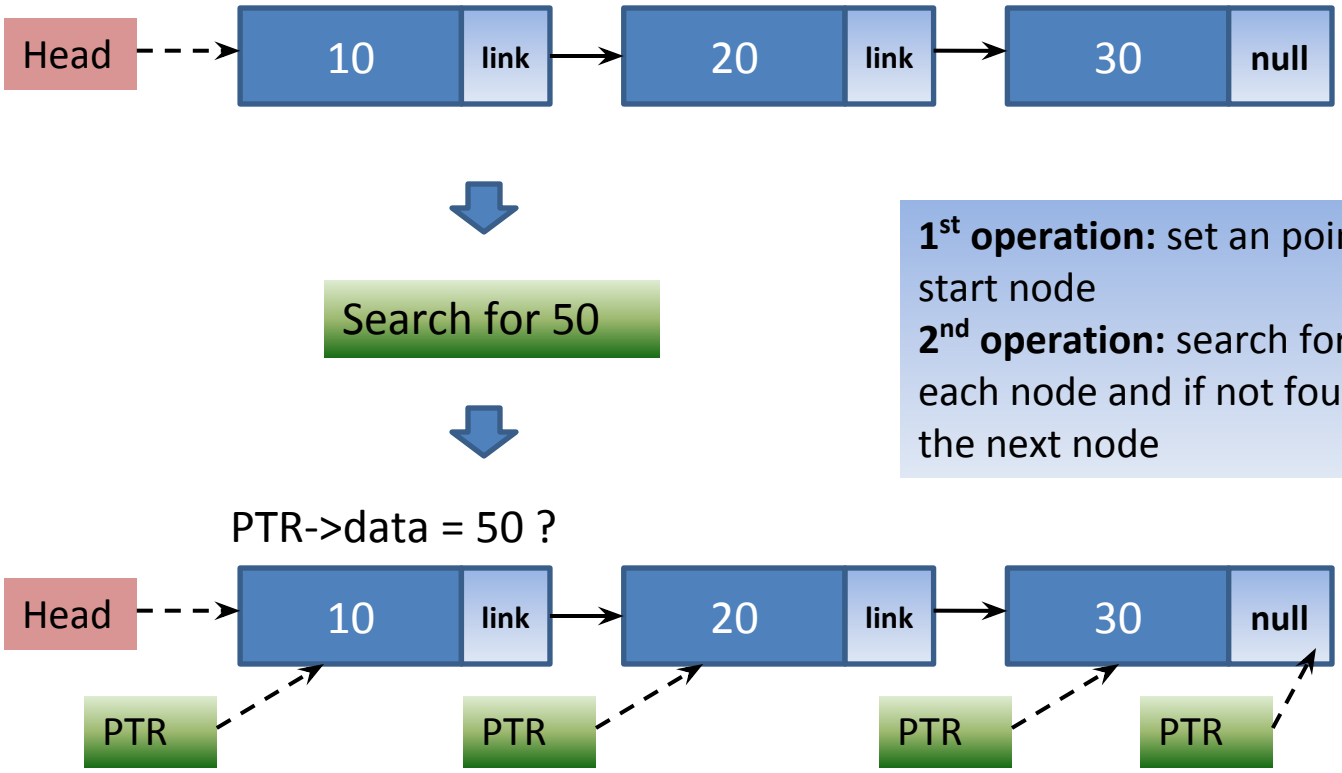


1st operation: set an pointer PTR to the start node
2nd operation: search for the data in each node and if not found traverse to the next node

Search successful

Linked List

- Singly Linked List
  - Searching data in the list



1st operation: set an pointer PTR to the start node
2nd operation: search for the data in each node and if not found traverse to the next node

Un-successful search

Linked List

- Singly Linked List
  - Searching data in the list (algorithm)

```
Searching(LL, X)  // X is the stored data which node has to be searched
{
  if LL = null
     Print "Empty list" and return
  else
     set PTR := Head          // PTR is a pointer set to Head of the list
     while PTR not equal to null   // traversing the entire list
          if PTR -> data = X
             Print "Data found" and return
          PTR := PTR->next
     Print "Data not found"
}
```

Linked List

- Singly Linked List
  - Display the list (algorithm)

```
Searching(LL)  // LL is the existing list
{
  if LL = null
     Print "Empty list" and return
  else
     set PTR := Head          // PTR is a pointer set to Head of the list
     while PTR not equal to null   // traversing the entire list
              Print PTR->data
              PTR := PTR->next
}
```

Linked List

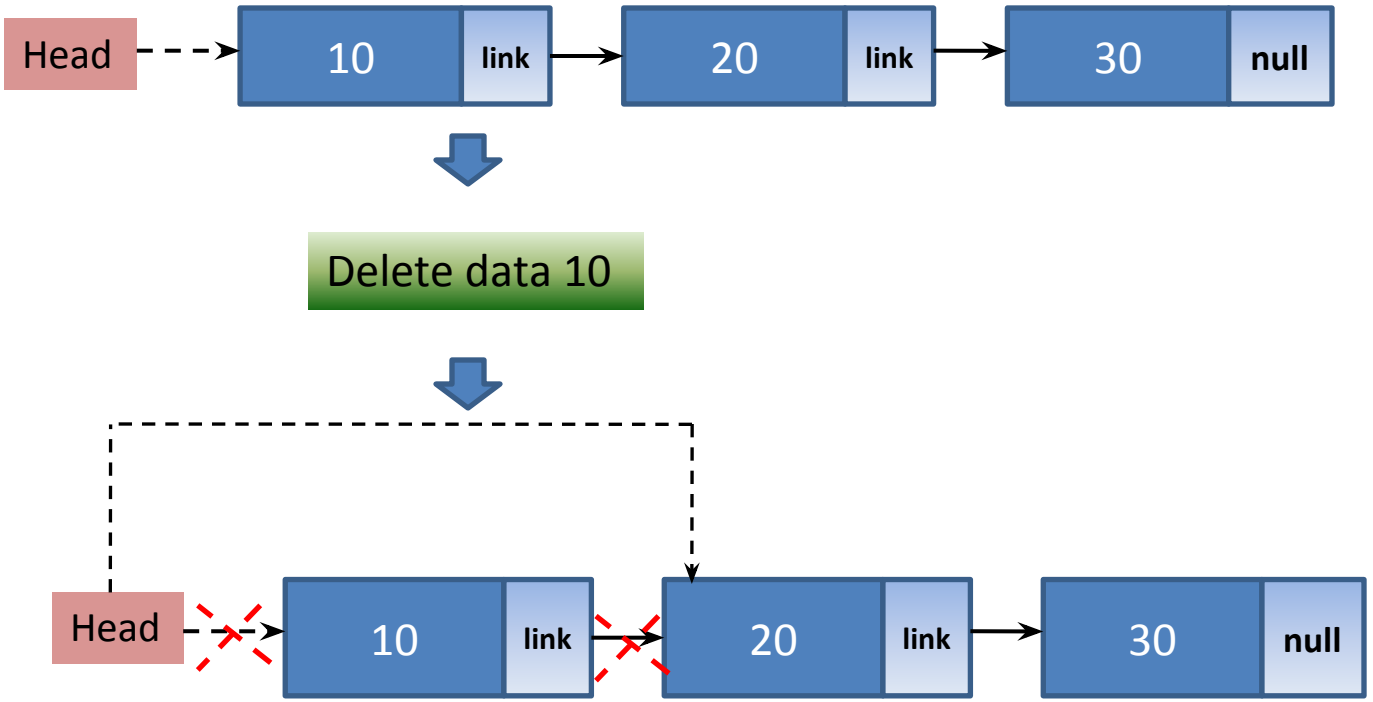
- Singly Linked List

  - Node Deletion
    - Delete start node
    - Delete last node
    - Delete node from middle

During implementation, one needs to merge all conditions in a single code

Linked List

- Singly Linked List
  - Delete first node



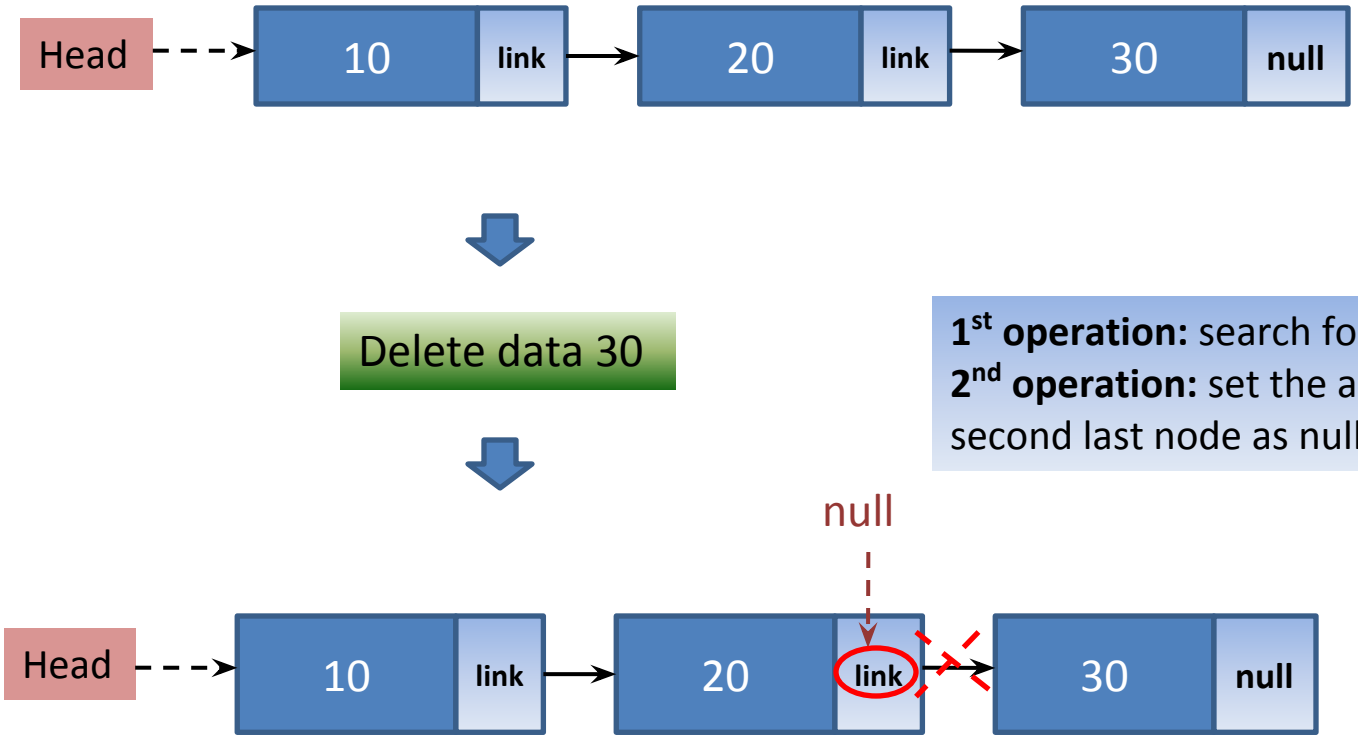
Linked List

- Singly Linked List
  - Delete first node (algorithm)

```
Delete_beginning(LL)  // LL is the existing list
{
  if Head->next = null
      Head := null
  else
      Head := Head ->next
}
```

Linked List

- Singly Linked List
  - Delete last node



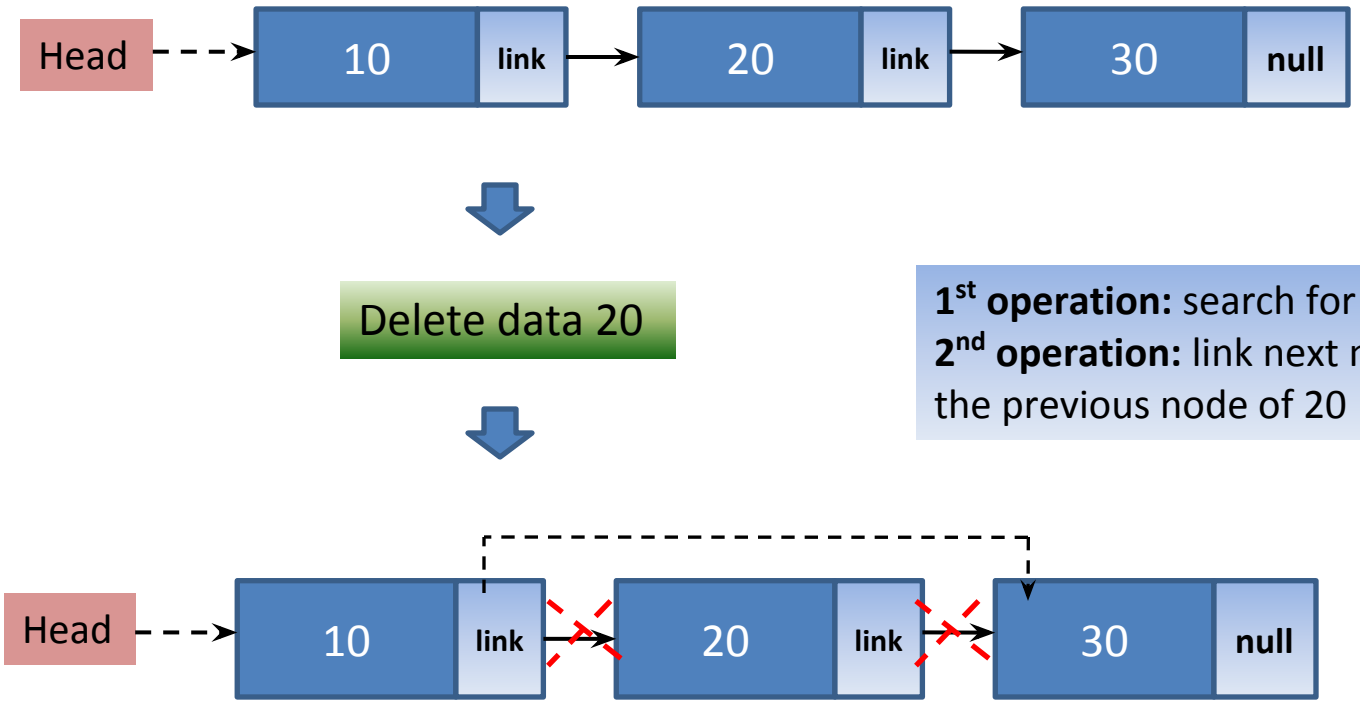
Linked List

- Singly Linked List
  - Deletion of last node (algorithm)

```
Delete_end(LL)  // LL is the existing linked list
{
  if Head->next = null
     Head := null
  else
     set PTR := Head          // PTR is a pointer set to Head of the list
     while PTR->next->next not equal to null   // searching for the
        set PTR := PTR -> next                 //  second last node
     PTR->next := null
}
```

Linked List

- Singly Linked List
  - Node deletion from middle of list



1st operation: search for data 20
2nd operation: link next node of 20 with the previous node of 20

Linked List

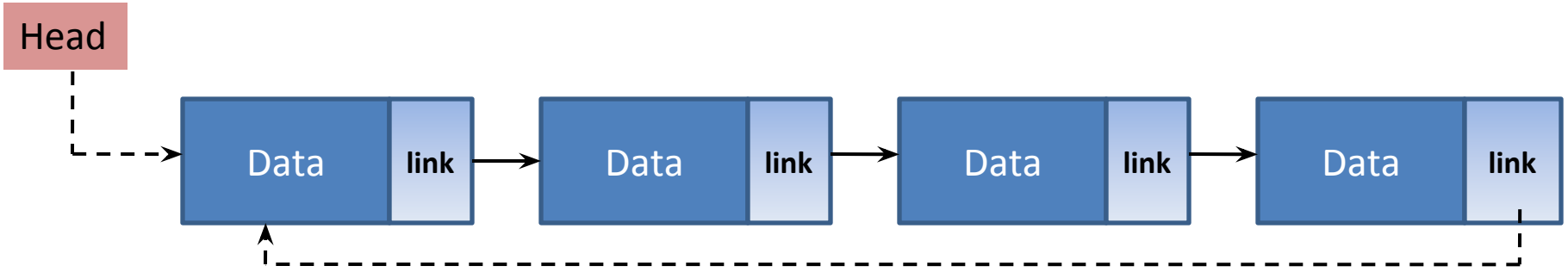
- Singly Linked List
  - Node deletion from middle of list (algorithm)

```
Delete_middle(LL, X)  // X is the stored data which node has to be deleted
{
  if Head->next = null
     Head := null
  else
     set PTR := Head          // PTR is a pointer set to Head of the list
      while PTR->next->data not equal to X   // searching for the previous node
         set PTR := PTR -> next                    // of the node to be deleted
      PTR->next := PTR->next->next
}
```

Circular Linked List

Linked List

- Circular Linked List
  - Property
    - It is an unidirectional linked list, conventionally data can be processed from left to right
    - Head pointer holds the first node of the list
    - The last node of the list holds the address of the first node



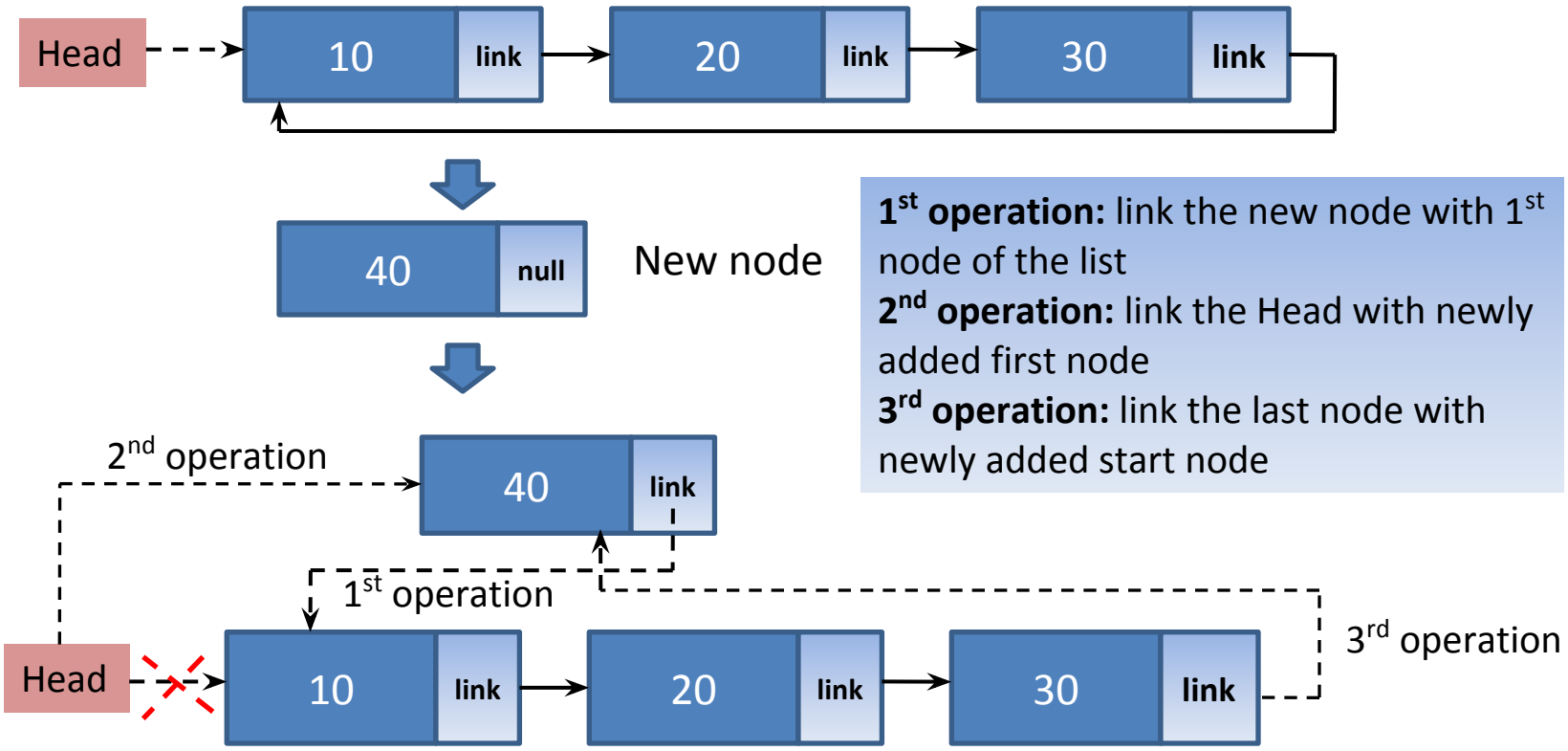
Linked List

- Circular Linked List

  - Node Insertion
    - Insert at the beginning
    - Insert at last
    - Insert in middle

Linked List

- Circular Linked List
  - Node Insertion at beginning of list



1st operation: link the new node with 1st node of the list
2nd operation: link the Head with newly added first node
3rd operation: link the last node with newly added start node

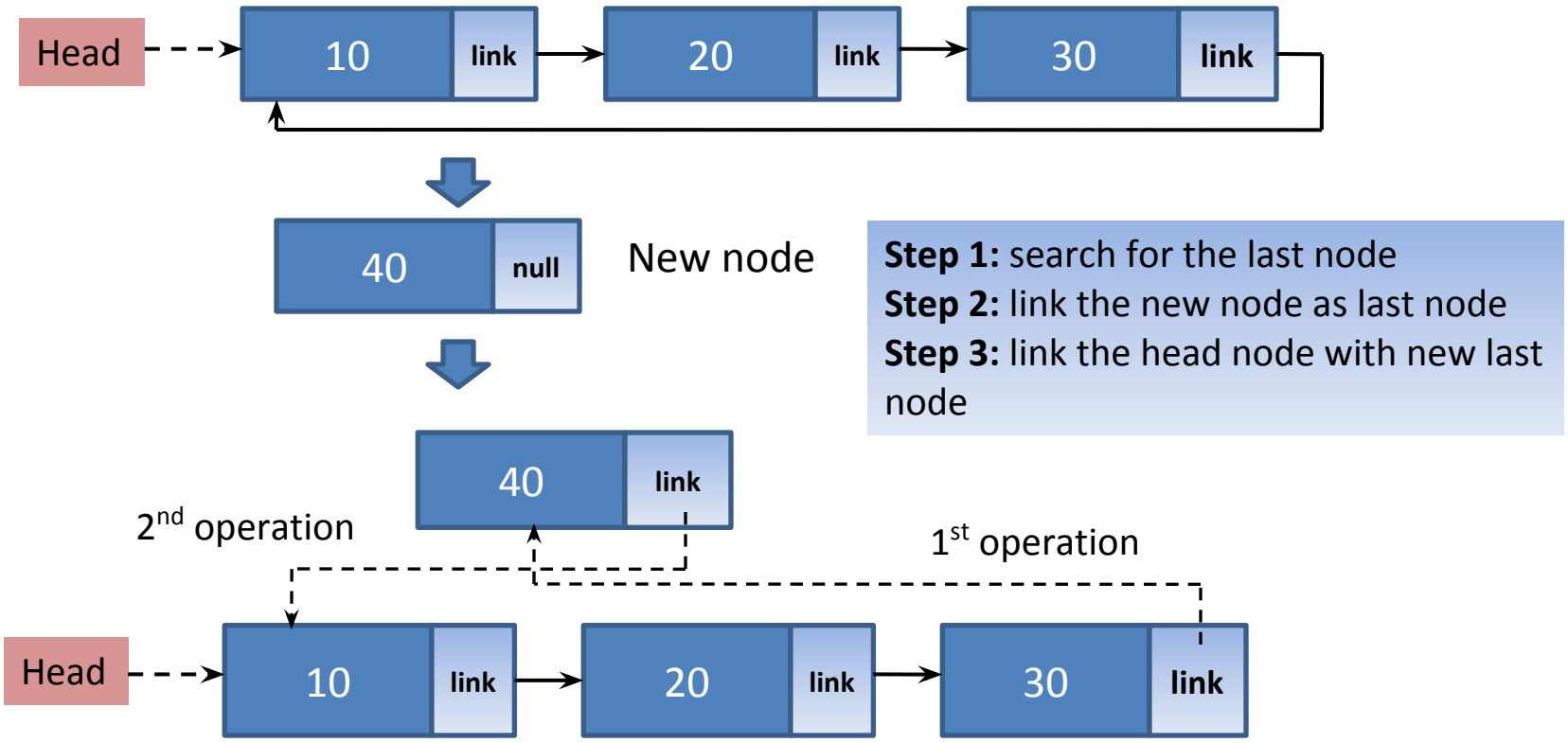
Linked List

- Circular Linked List
  - Node Insertion at beginning of list (algorithm)

```
Insert_beginning(LL, N)  // N is new node to insert in existing list LL
{
 if LL = null
    Head := N
 else
    set PTR :=Head
    while PTR->next not equal to Head   // set PTR at last node
         PTR:= PTR->next
    N->next := Head      // N->next indicates the address part of N
    Head := N
    PTR->next := Head
}
```

Linked List

- Circular Linked List
  - Node Insertion at end of list



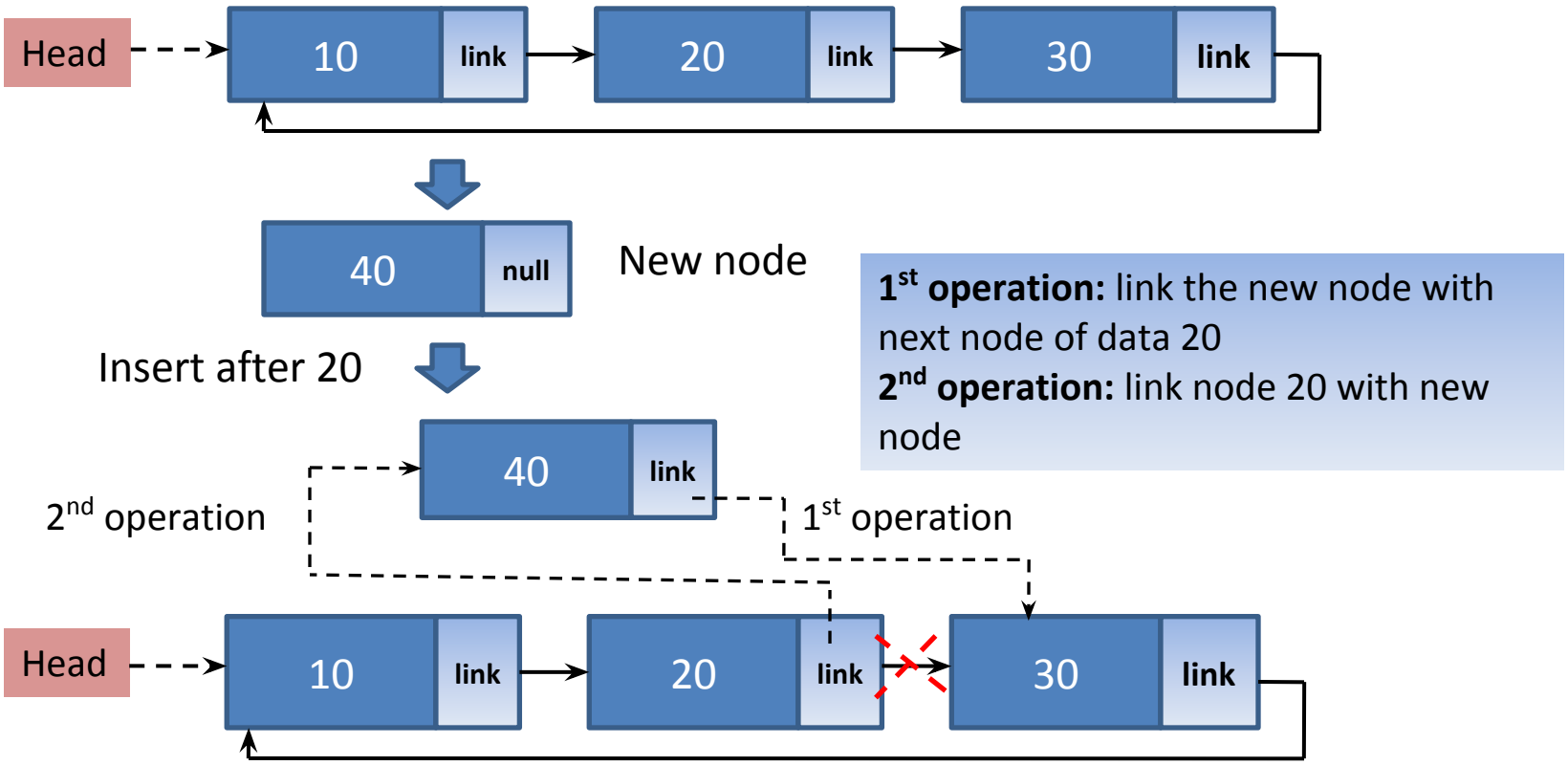
Linked List

- Circular Linked List
  - Node Insertion at end of list (algorithm)

```
Insert_end(LL, N)  // N is new node to insert in existing list LL
{
 if LL = null
    Head := N
 else
    set PTR :=Head
    while PTR->next not equal to Head   // set PTR at last node
         PTR:= PTR->next
    PTR->next := N
    N->next := Head
}
```

Linked List

- Circular Linked List
  - Node Insertion in middle of list



1st operation: link the new node with next node of data 20
2nd operation: link node 20 with new node

Linked List

- Circular Linked List
  - Node Insertion in middle of list (algorithm)

```
Insert_middle(LL, N, X)  // N is new node to insert after a node having data 20
{
  if LL = null
      Head := N
  else
     set PTR := Head          // PTR is a pointer set to Head of the list
      while PTR->data not equal to X   // searching for specific node
          set PTR := PTR -> next
      N->next := PTR->next
      PTR->next := N
}
```

Queries?