Linked List

A **linked list** is a linear data structure that consists of a series of nodes connected by pointers.

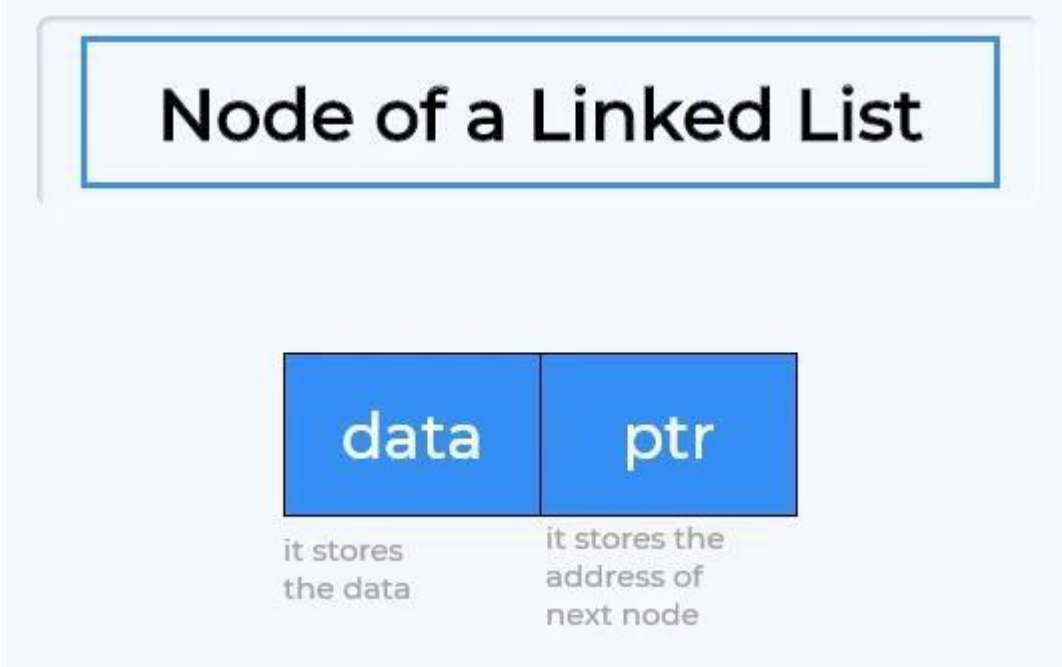
It consists of nodes where each node contains **data** and a **reference (link)** to the next node in the sequence. This allows for dynamic memory allocation and efficient **insertion** and **deletion** operations compared to arrays.

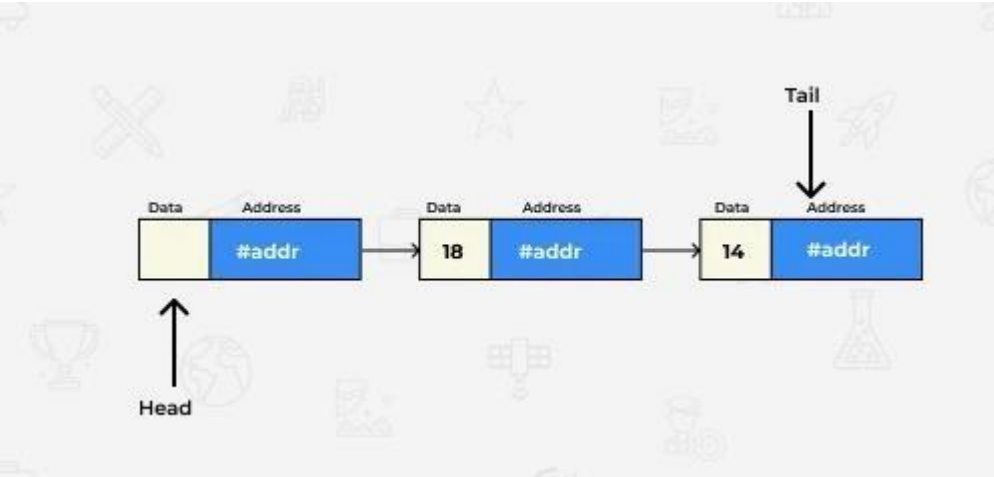
Linked List Applications

- Implementing stacks and queues using linked lists.
- Using linked lists to handle collisions in hash tables.
- Representing graphs using linked lists.
- Allocating and deallocating memory dynamically.

Linked List:

- **Data Structure:** Non-contiguous
- **Memory Allocation:** Dynamic
- **Insertion/Deletion:** Efficient
- **Access:** Sequential





Types of Linked List:

a) Singly Linked List
b) Doubly Linked List
c) Circular Linked List

- Singly Linked list

In C++ the singly linked list can be represented with a class and a **Node** class separately, which has two members, namely data and a **next** pointer which points to the next node.

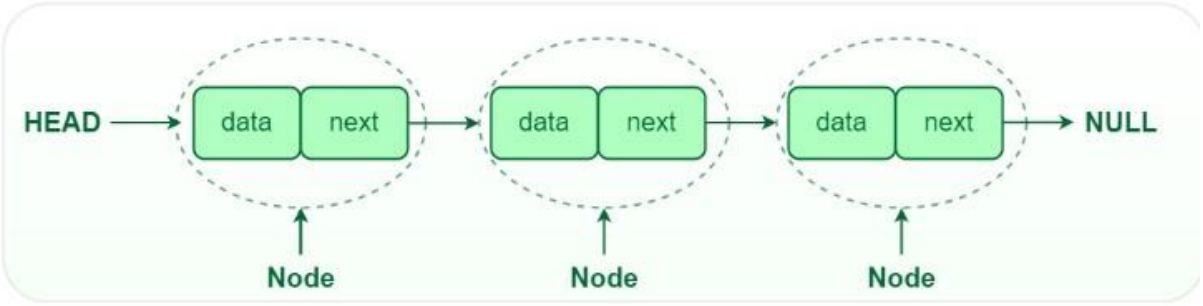
Operations:

InsertNode:

- Insertion is done at the end of the list.
- Insertion is done at the beginning of the list
- Insertion is done at the specific positions.

DeleteNode:

- Deletion is done using the **index** of the node.
- Deletion is done at the beginning of the list.
- Deletion is done at the end of the list.



- Doubly Linked List

Doubly Linked List in C++ is very similar to a linked list, except that each node also contains a pointer to the node previous to the current one. This means that in a doubly linked list in C++ we can travel not only in the forward direction, but also in the **backward direction**, which was not possible with a singly linked list.

Inserting a new node in a doubly linked list is very similar to inserting new node in linked list. There is a little extra work required to maintain the link of the previous node. A node can be inserted in a Doubly Linked List in three ways:

- At the front of the DLL. • In between two nodes
- At the end of the DLL.

The deletion of a node in a doubly-linked list can be divided into three main categories:

- **Deletion of the head node.**
- **Deletion of the middle node.**
- **Deletion of the last node.**

- Circular Linked List

*The **circular linked list** is a linked list where all nodes are connected to form a circle. In a circular linked list, the first node and the last node are connected to each other which forms a circle. There is no NULL at the end.*