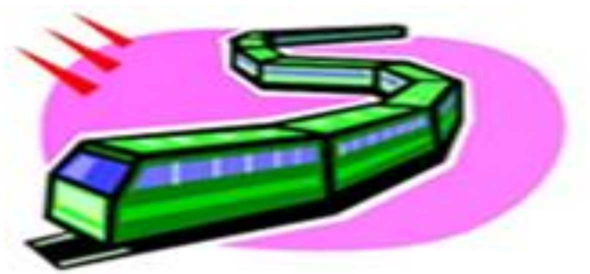
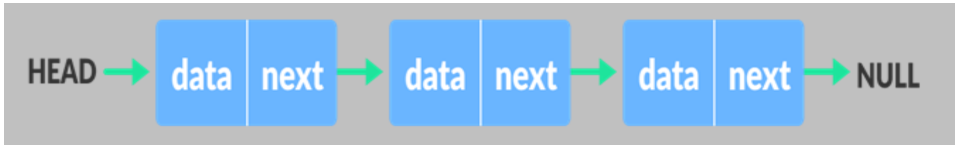
Linked List





By
Dr. Nadia M. Mohammed

Types of Data Structure

There are two types of data structure:

1- Static Data Structure.

2- Dynamic Data Structure.

The Differences between
Static and Dynamic Data Structure

There are four differences between Static Data Structure and Dynamic Data Structure:

1) The Storage Space.

2) Insert and Delete operation.

3) Random Access to the element.

4) Merge and Split operation.

What is Linked List?

Linked list: is a linear data structure that contains sequence of elements such that each element links to its next element in the sequence.

Linked list has three types :

1- Single Link List (SLL).

2- Double Link List (DLL).

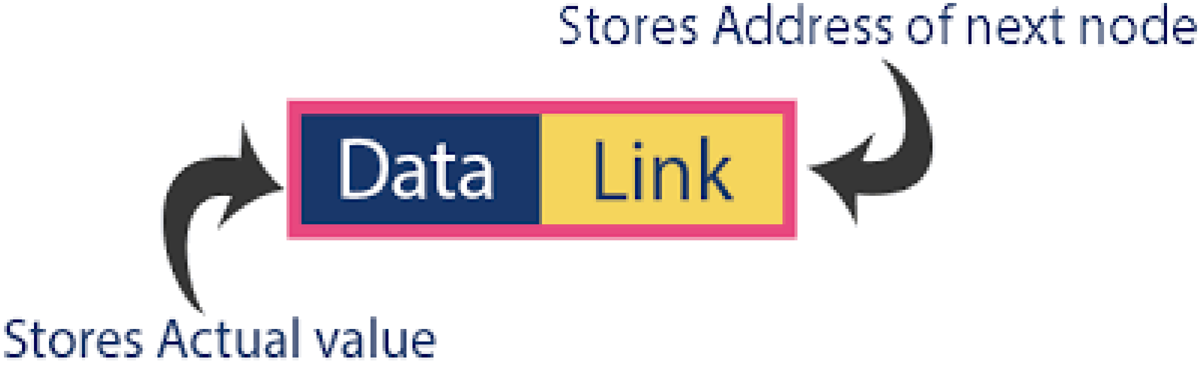
3- Circular Link List (CLL).

What is Single Linked List?

Single link list: is a sequence of elements in which every element has link to its next element in the sequence.

- The individual element is called as **"Node".**
- Every **"Node"** contains two fields, **data** and **next**.
- **Data field:** is used to store actual value of that node.
- **Link Field:** and next field is used to store the address of the next node in the sequence.

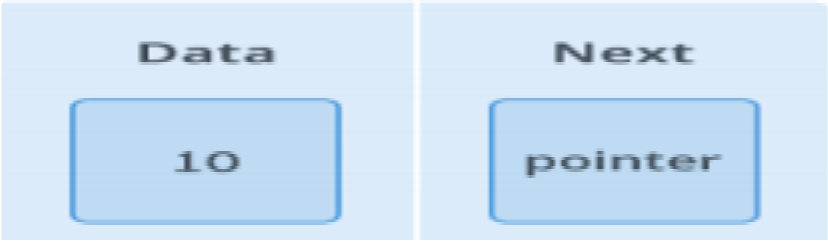
Single Linked List

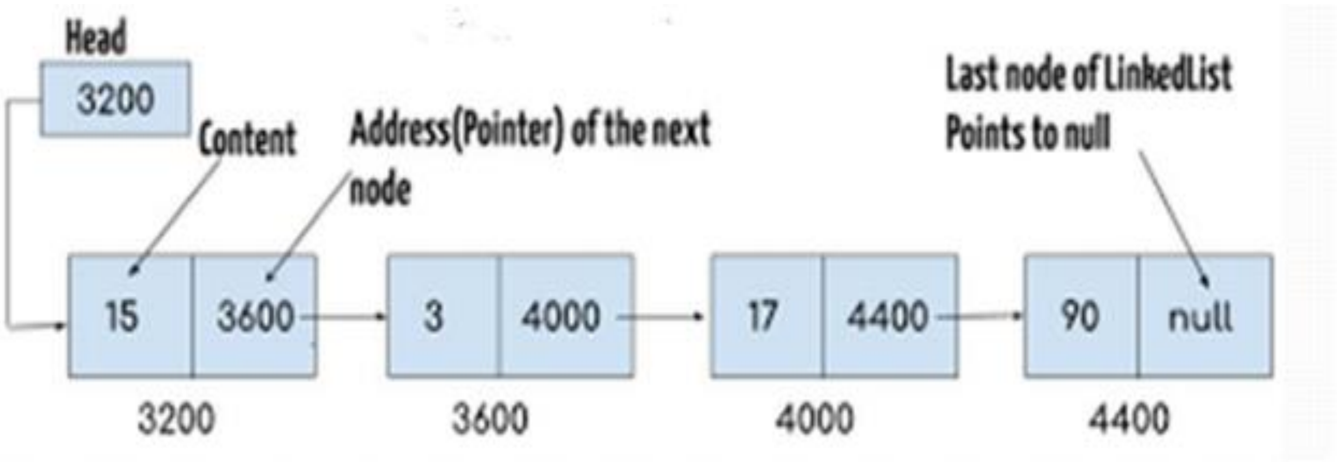


Note

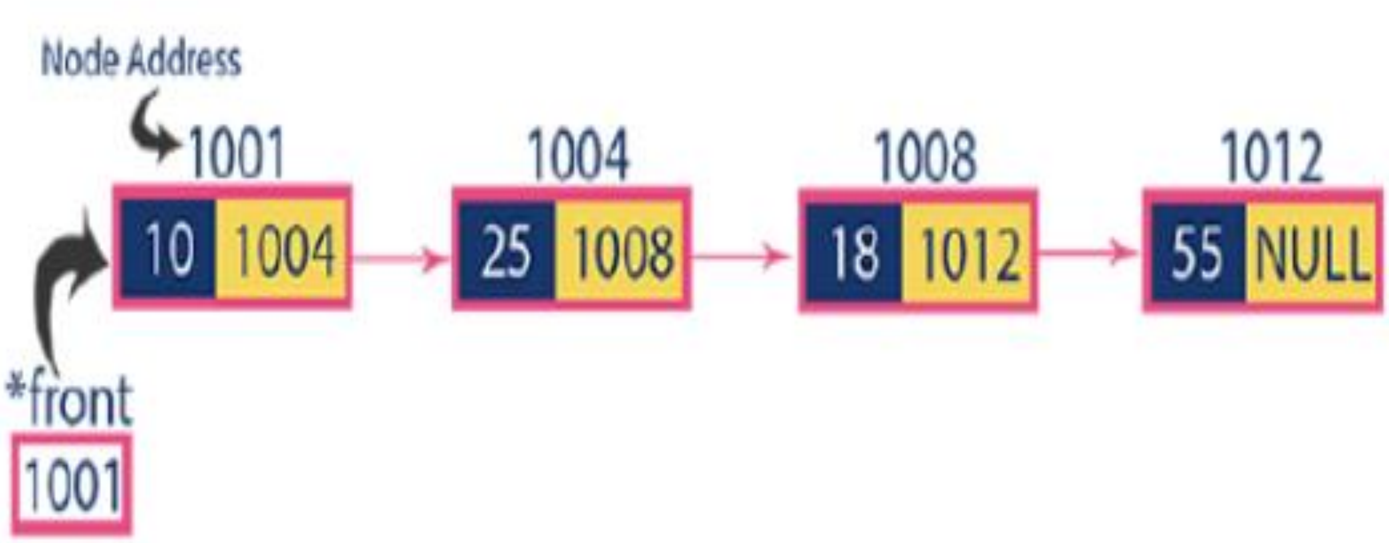
- In a single Linked List, the address of the first node is always stored in a reference node known as “front” (Some times it is also known as “head”).
- Always next part (reference part) of the last node must be NULL.

Single Linked List

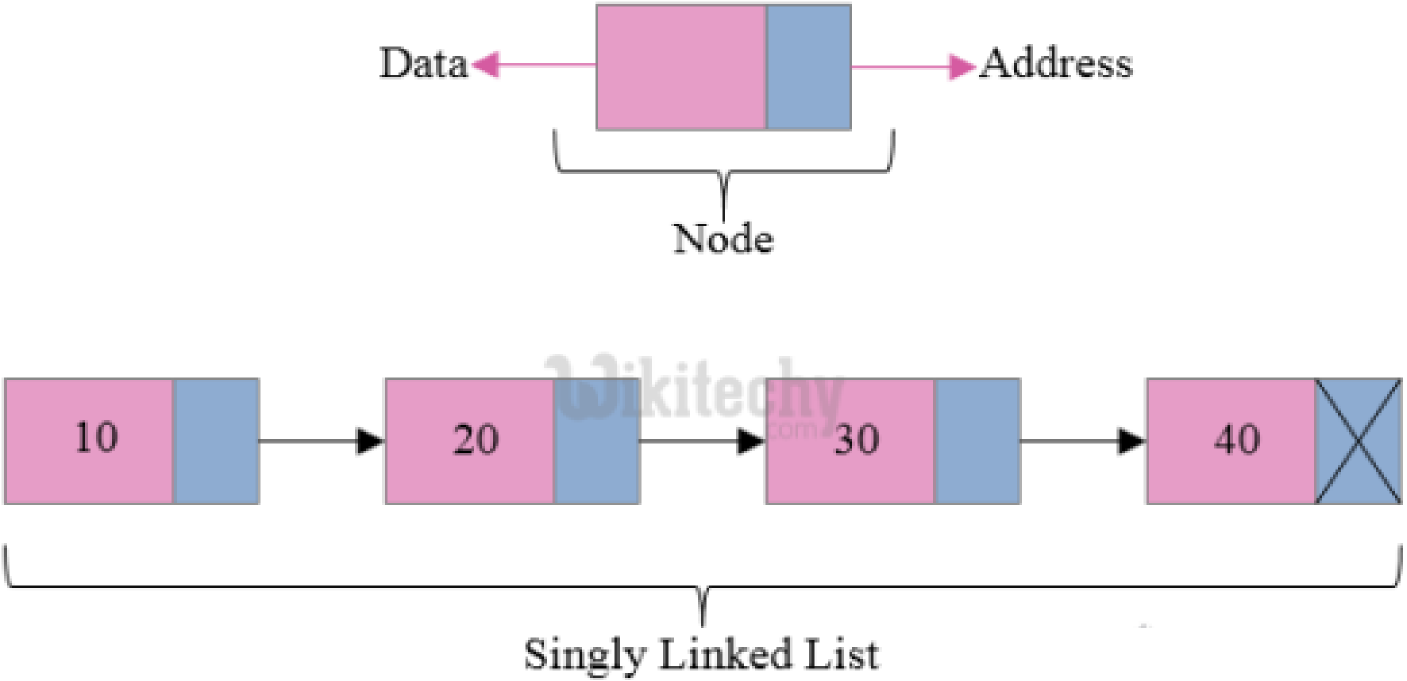




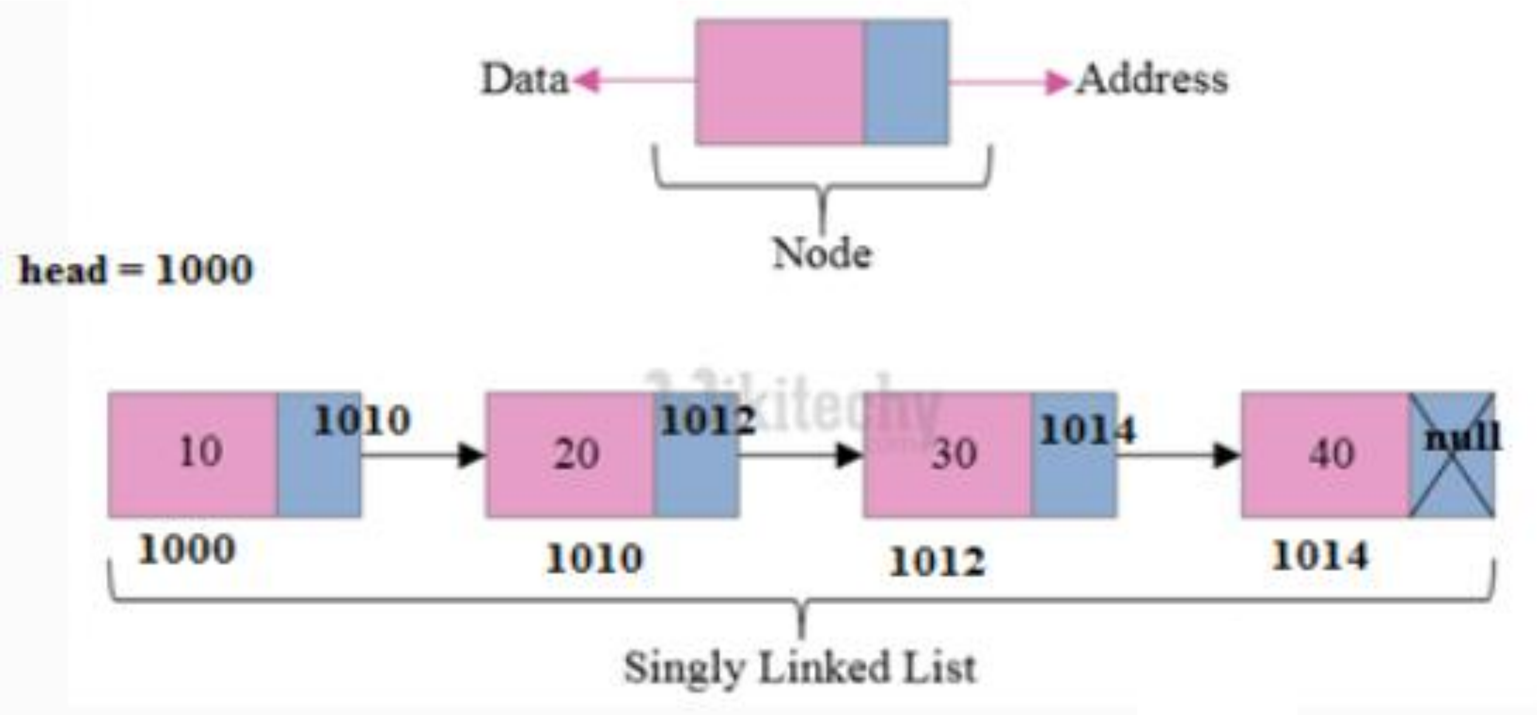
Example for SLL



Example for SLL



solution


Data
Address
Node
head = 1000
10
1010
20
1012
30
1014
40
null
1000
1010
1012
1014
Singly Linked List
Wikitechy

Operations in Single Linked List

In a single linked list we perform the following operations:

1. Insertion
2. Deletion
3. Display

Before we implement actual operations, first we need to setup empty list. First perform the following steps before implementing actual operations.

Step 1: Include all the **header files** which are used in the program.

Step 2: Declare all the **user defined** functions. **Step 3:** Define a **Node** structure with two members **data** and **next.**

Step 4: Define a Node pointer '**head**' and set it to **NULL**.

Step 5: Implement the **main** method by displaying operations menu and make suitable function calls in the main method to perform user selected operation.

Insertion in SLL

In a single linked list, the insertion operation can be performed in three ways. They are as follows:

1. Inserting At Beginning of the list.
2. Inserting At End of the list.
3. Inserting At Specific location in the list.

Inserting At Beginning of the SLL

- We can use the following steps to insert a new node at beginning of the single link list

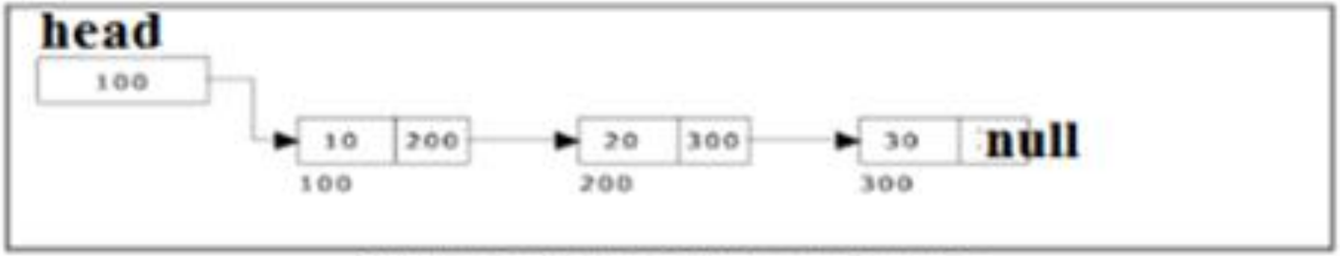
Step 1: Create a **newNode** with given value.

Step 2: Check whether list is **Empty (head == NULL).**

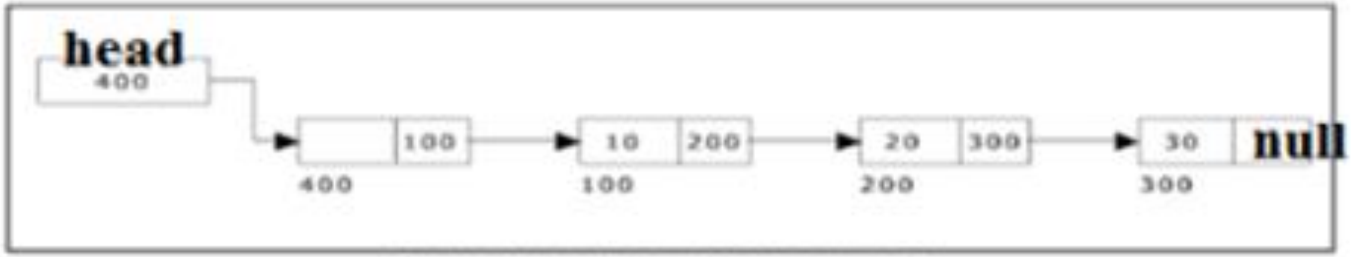
Step 3: If it is **Empty** then, set **newNode→next = NULL** and **head = newNode**.

Step 4: If it is **Not Empty** then, set **newNode→next = head** and **head = newNode**.

Inserting At Beginning of the SLL



Single Linked List without a header node



Single Linked List with header node

Inserting At End of the SLL

We can use the following steps to insert a new node at end of the single linked list:

Step 1: Create a **newNode** with given value and **newNode** → **next** as **NULL**.

Step 2: Check whether list is **Empty** (**head == NULL**).

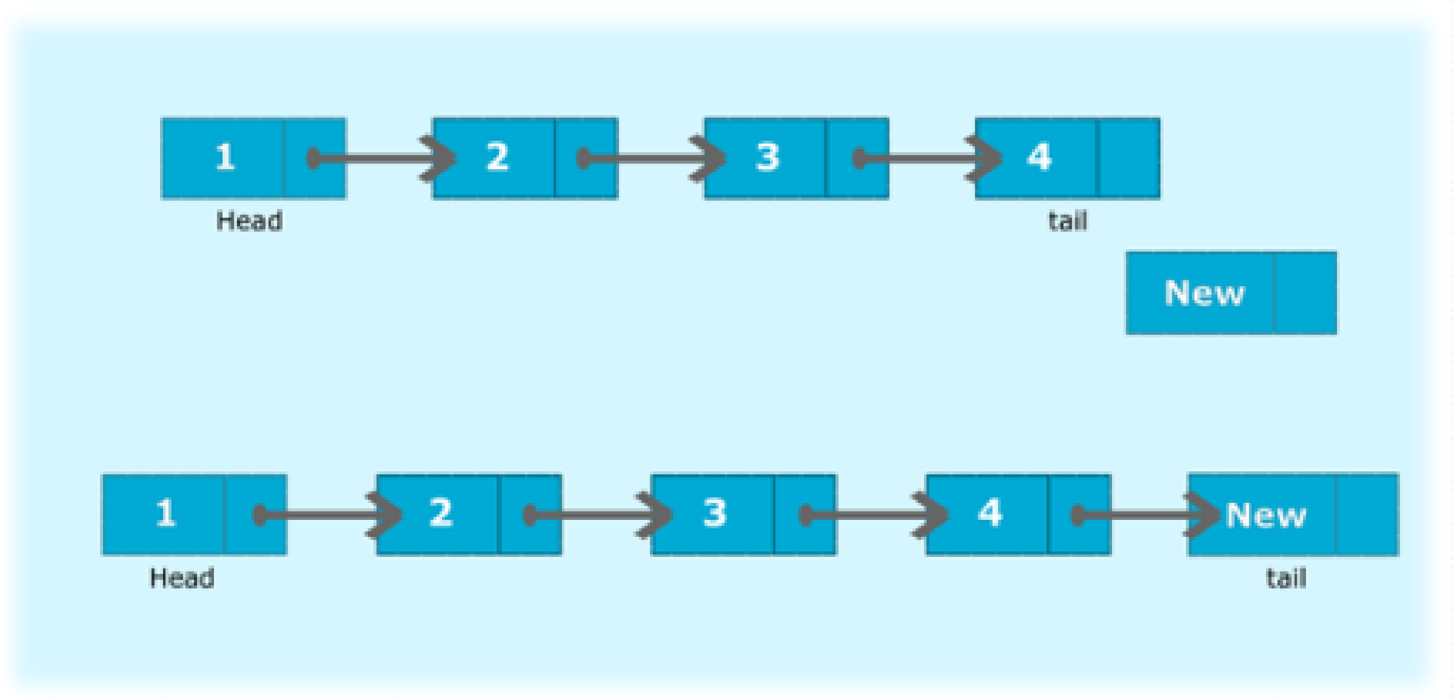
Step 3: If it is **Empty** then, set **head = newNode**.

Step 4: If it is **Not Empty** then, define a node pointer **temp** and initialize with **head**.

Step 5: Keep moving the **temp** to its next node until it reaches to the last node in the list (until **temp** → **next** is equal to **NULL**).

Step 6: Set **temp** → **next = newNode**.

Inserting At End of the SLL



Displaying a Single Linked List

We can use the following steps to display the elements of a single linked list:

Step 1: Check whether list is **Empty (head == NULL)**
Step 2: If it is **Empty** then, display **'List is Empty!!!'** and terminate the function.

Step 3: If it is **Not Empty** then, define a Node pointer **'temp'** and initialize with **head**.

Step 4: Keep displaying **temp → data** with an arrow (--->) until **temp** reaches to the last node

Step 5: Finally display **temp → data** with arrow pointing to **NULL** (**temp → data ---> NULL**).