### **Task Management System**

### Types of Linked Lists

#### **1. Singly Linked List**

* Each node points to the next node.
* Traversal is only forward.
* Last node points to null.

#### **2. Doubly Linked List**

* Each node points to both the next and previous nodes.
* Traversal is possible in both directions.
* Last node’s next is null, first node’s previous is null.

#### **3. Circular Linked List**

* Can be singly or doubly linked.
* Last node points back to the first node (instead of null).
* Traversal can continue indefinitely in a loop.
* Useful for applications like round-robin scheduling.

### **Time Complexity Analysis**

| Operation | Singly LL |
| --- | --- |
| Add (end) | O(n) |
| Traverse | O(n) |
| Search | O(n) |
| Delete | O(n) |

* With a tail pointer, adding at the end can be O(1) for circular and doubly linked lists.

### **Advantages of Linked Lists Over Arrays for Dynamic Data**

* **Dynamic Size:** No need to define size in advance.
* **Efficient Insertions/Deletions:** No shifting of elements, just pointer updates.
* **No Memory Wastage:** Memory allocated as needed.
* **Circular Linked List:** Useful for applications needing continuous looping (e.g., round-robin tasks, playlist cycling).