



Vehicles Moving Along Roads (Linked List)

Imagine a highway with vehicles constantly moving. This scenario can be modeled using a linked list data structure.



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What is a Linked List?

1

Dynamic Data Structure

A linked list is a linear data structure that stores a collection of nodes, each containing data and a pointer to the next node.

2

Nodes

Each node in the list represents a data element, and the pointers connect the nodes to form a chain.

3

Flexible

Linked lists are flexible and can be easily modified to insert or remove nodes, even in the middle of the list.



Singly Linked List

1

Head

The first node in the list, typically referred to as the head, serves as the entry point to access the entire list.

2

Nodes

Each node in the list contains data and a pointer to the next node.

3

Tail

The last node in the list, often called the tail, has a pointer that points to null, indicating the end of the list.



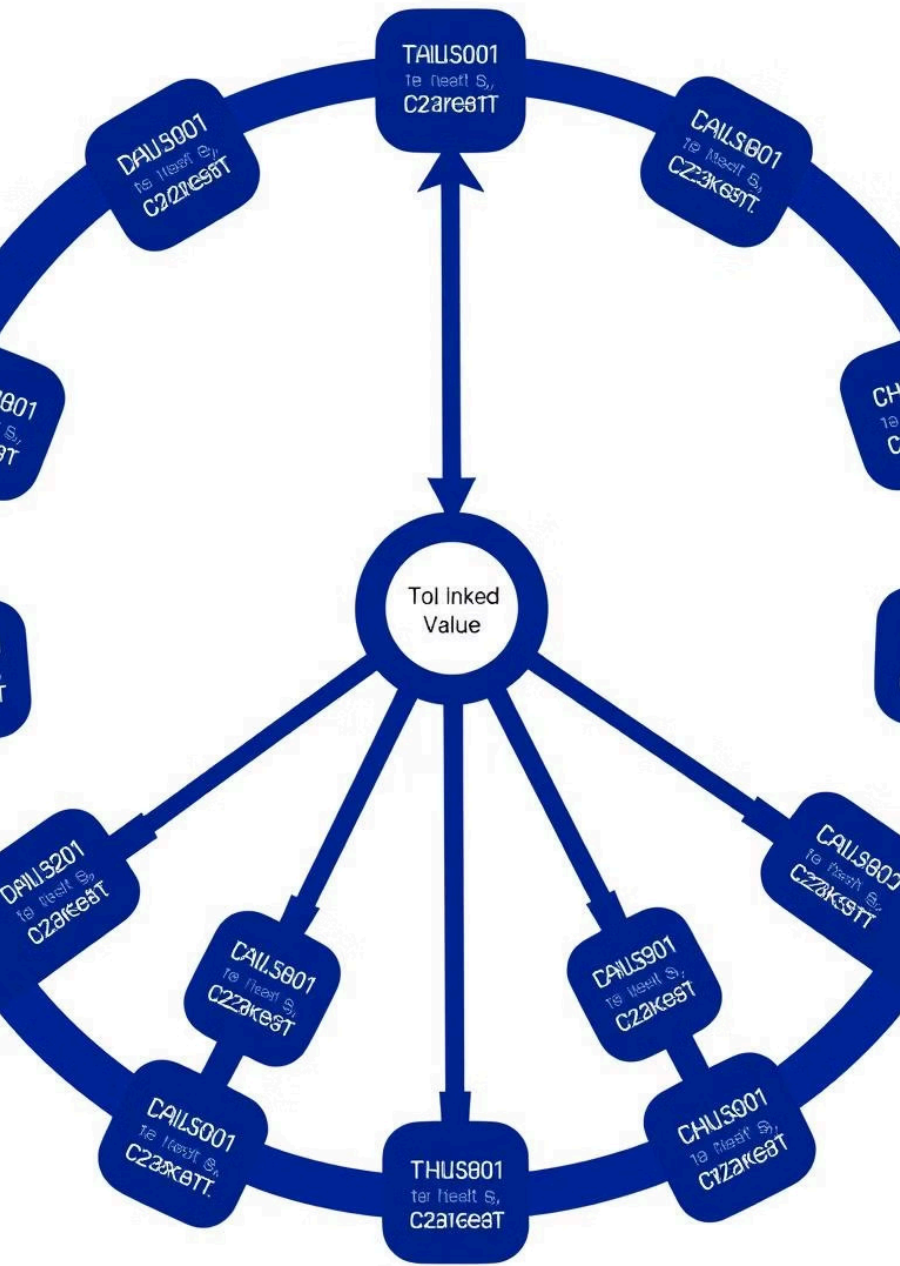
Doubly Linked List

Forward Pointer

Similar to a singly linked list, each node points to the next node in the sequence.

Backward Pointer

A distinguishing feature is that each node also has a pointer that points back to the previous node, enabling traversal in both directions.



Circular Linked List

Circular

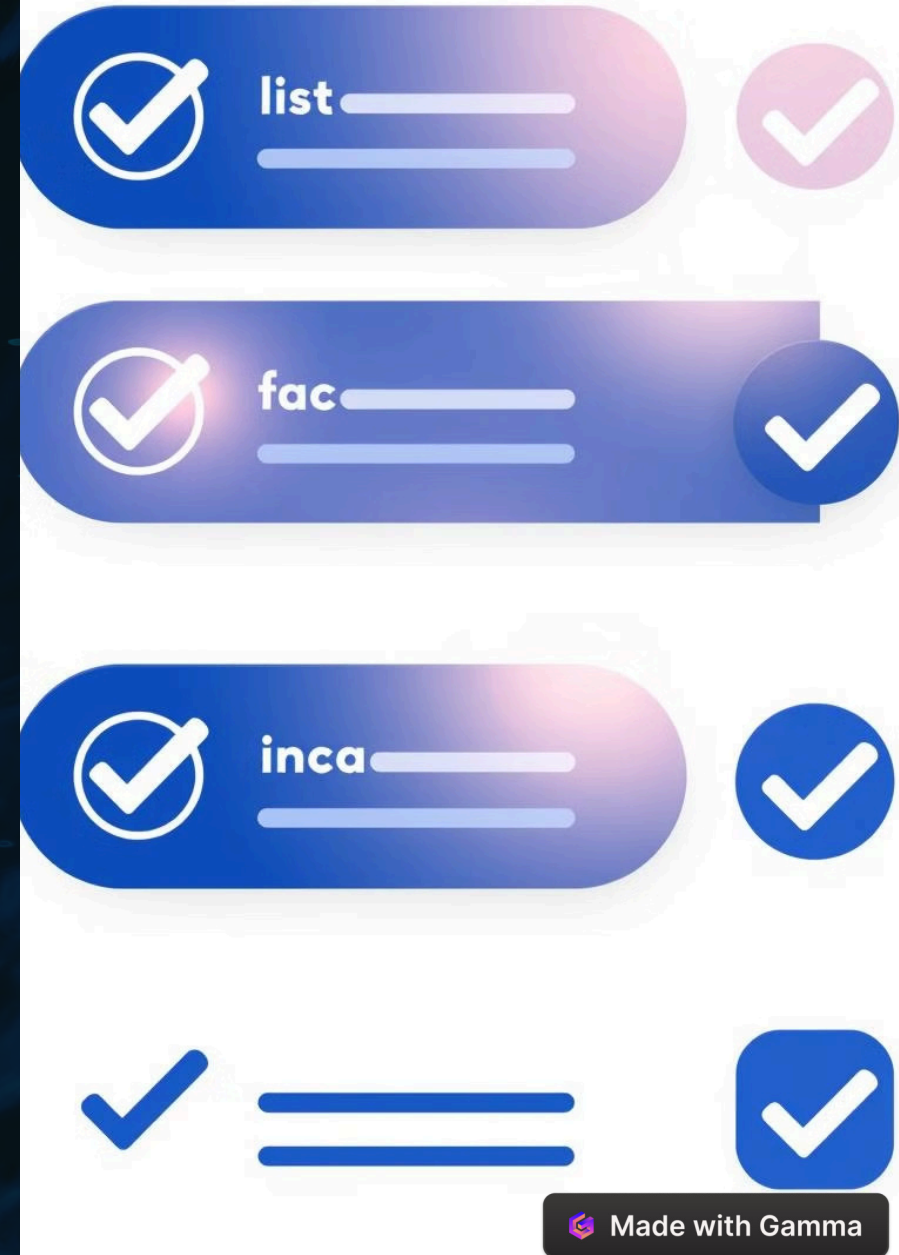
In a circular linked list, the last node's pointer points back to the head, creating a closed loop.

No End

This circular structure eliminates the concept of a "tail" node, as the list continues indefinitely.

Advantages of Linked Lists

Dynamic Memory Allocation	No need for fixed-size memory blocks like arrays.
Insertion and Deletion	Easy to add or remove nodes in any position.
Efficient Storage	No wasted memory for unused elements, unlike arrays.



Real-World Applications of Linked Lists



Music Players

Playlists in music players can be implemented as linked lists, allowing users to add or remove songs easily.



Web Browsers

Browser history is often represented as a linked list, allowing users to navigate back and forth through visited pages.



Undo/Redo Functionality

Text editors and other applications use linked lists to store a history of actions, enabling undo and redo operations.