DSA Linked Lists Types

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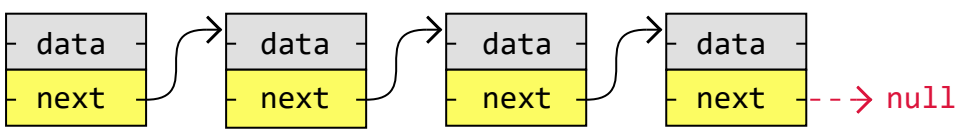
Types of Linked Lists

There are three basic forms of linked lists:

1. Singly linked lists
2. Doubly linked lists
3. Circular linked lists

A **singly linked list** is the simplest kind of linked lists. It takes up less space in memory because each node has only one address to the next node, like in the image below.



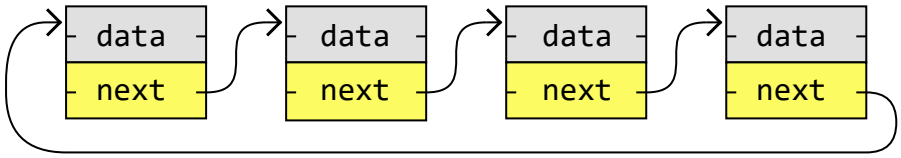
A **doubly linked list** has nodes with addresses to both the previous and the next node, like in the image below, and therefore takes up more memory. But doubly linked lists are good if you want to be able to move both up and down in the list.

A **circular linked list** is like a singly or doubly linked list with the first node, the "head", and the last node, the "tail", connected.

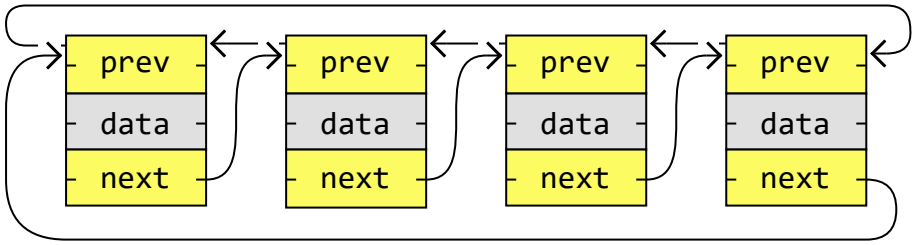
In singly or doubly linked lists, we can find the start and end of a list by just checking if the links are `null`. But for circular linked lists, more complex code is needed to explicitly check for start and end nodes in certain applications.

Circular linked lists are good for lists you need to cycle through continuously.

The image below is an example of a singly circular linked list:



The image below is an example of a doubly circular linked list:



Note: What kind of linked list you need depends on the problem you are trying to solve.

Linked List Implementations

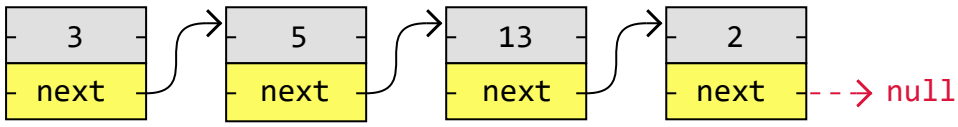
Below are basic implementations of:

1. Singly linked list

The next page will cover different operations that can be done on linked lists.

1. Singly Linked List Implementation

Below is an implementation of this singly linked list:



Example

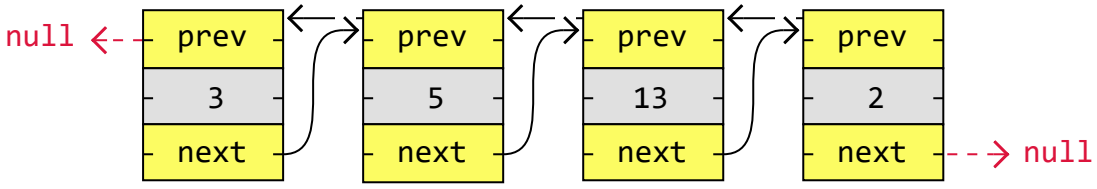
A basic singly linked list in Python:

(This is the same example as on the bottom of the previous page.)

```
class Node:
    def __init__(self, data):
        self.data = data
        self.next = None

node1 = Node(3)
node2 = Node(5)
node3 = Node(13)
node4 = Node(2)

node1.next = node2
node2.next = node3
node3.next = node4

currentNode = node1
while currentNode:
    print(currentNode.data, end=" -> ")
    currentNode = currentNode.next
print("null")
```

2. Doubly Linked List Implementation

Below is an implementation of this doubly linked list:



Example

A basic doubly linked list in Python:

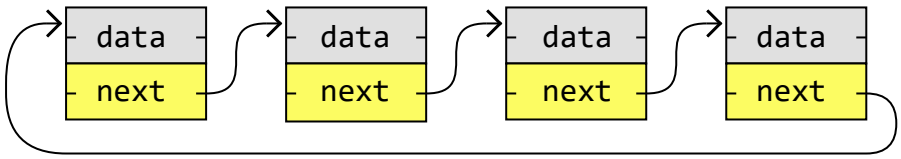
```
class Node:
    def __init__(self, data):
        self.data = data
        self.next = None
        self.prev = None

node1 = Node(3)
node2 = Node(5)
node3 = Node(13)
node4 = Node(2)

node1.next = node2

node2.prev = node1
node2.next = node3

node3.prev = node2
node3.next = node4

node4.prev = node3

print("\nTraversing forward:")
currentNode = node1
```

```
print("\nTraversing backward:")
currentNode = node4
while currentNode:
    print(currentNode.data, end=" -> ")
    currentNode = currentNode.prev
print("null")
```

Try it Yourself »

3. Circular Singly Linked List Implementation

Below is an implementation of this circular singly linked list:



Example

A basic circular singly linked list in Python:

```
class Node:
    def __init__(self, data):
        self.data = data
        self.next = None

node1 = Node(3)
node2 = Node(5)
node3 = Node(13)
node4 = Node(2)

node1.next = node2
```

```
currentNode = node1

print(currentNode.data, end=" -> ")
currentNode = currentNode.next

while currentNode != startNode:
    print(currentNode.data, end=" -> ")
    currentNode = currentNode.next

print("...")
```

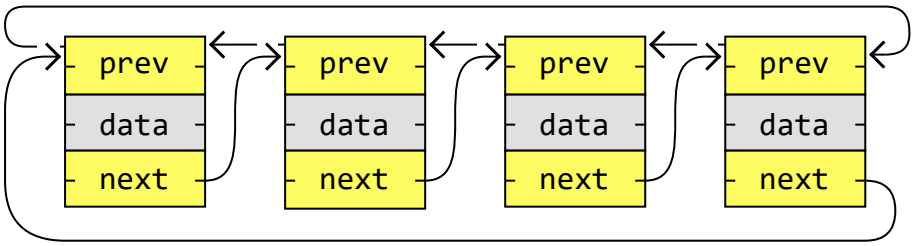
Try it Yourself »

Line 14: This makes the singly list circular.

Line 17: This is how the program knows when to stop so that it only goes through the list one time.

4. Circular Doubly Linked List Implementation

Below is an implementation of this circular doubly linked list:



Example

A basic circular doubly linked list in Python:

```
        self.next = None
        self.prev = None

node1 = Node(3)
node2 = Node(5)
node3 = Node(13)
node4 = Node(2)

node1.next = node2


node2.prev = node1
node2.next = node3

node3.prev = node2
node3.next = node4

node4.prev = node3


print("\nTraversing forward:")
currentNode = node1

print(currentNode.data, end=" -> ")
currentNode = currentNode.next

while currentNode != startNode:
    print(currentNode.data, end=" -> ")
    currentNode = currentNode.next
print("...")

print("\nTraversing backward:")
currentNode = node4
startNode = node4
print(currentNode.data, end=" -> ")
currentNode = currentNode.prev

while currentNode != startNode:
    print(currentNode.data, end=" -> ")

```

Lines 13 and 22: These links makes the doubly linked list circular.

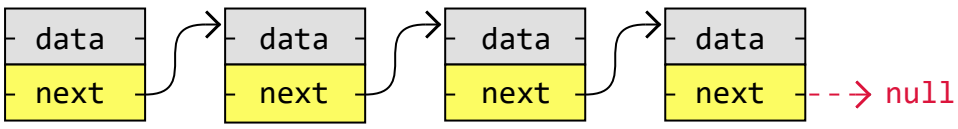
Lines 26: This is how the program knows when to stop so that it only goes through the list one time.

DSA Exercises

Test Yourself With Exercises

Exercise:

Take a look at this singly Linked List:

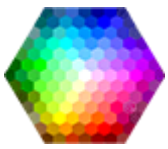


How can we make this Linked List circular?

```
The list can be made circular
by connecting the next pointer
in the last node, to the        node.
```

Submit Answer »

COLOR PICKER



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