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Generic Linked List in C

Unlike **C++** and **Java**, **C** doesn't support generics. How to create a linked list in C that can be used for any data type? In C, we can use **void pointer** and function pointer to implement the same functionality. The great thing about void pointer is it can be used to point to any data type. Also, size of all types of pointers is always same, so we can always allocate a linked list node. Function pointer is needed process actual content stored at address pointed by void pointer.

Following is a sample C code to demonstrate working of generic linked list.

```
// C program for generic linked list
#include<stdio.h>
#include<stdlib.h>

/* A linked list node */
struct node
{
    // Any data type can be stored in this node
    void *data;

    struct node *next;
};

/* Function to add a node at the beginning of Linked List.
   This function expects a pointer to the data to be added
   and size of the data type */
void push(struct node** head_ref, void *new_data, size_t data_size)
{
    // Allocate memory for node
    struct node* new_node = (struct node*)malloc(sizeof(struct node));

    new_node->data = malloc(data_size);
    new_node->next = (*head_ref);

    // Copy contents of new_data to newly allocated memory.
    // Assumption: char takes 1 byte.
    int i;
    for (i=0; i<data_size; i++)
        *(char *)(new_node->data + i) = *(char *)(new_data + i);

    // Change head pointer as new node is added at the beginning
    (*head_ref) = new_node;
}

/* Function to print nodes in a given linked list. fpitr is used
   to access the function to be used for printing current node data.
```

```
Note that different data types need different specifier in printf() */
void printList(struct node *node, void (*fptr)(void *))
{
    while (node != NULL)
    {
        (*fptr)(node->data);
        node = node->next;
    }
}

// Function to print an integer
void printInt(void *n)
{
    printf(" %d", *(int *)n);
}

// Function to print a float
void printFloat(void *f)
{
    printf(" %f", *(float *)f);
}

/* Driver program to test above function */
int main()
{
    struct node *start = NULL;

    // Create and print an int linked list
    unsigned int_size = sizeof(int);
    int arr[] = {10, 20, 30, 40, 50}, i;
    for (i=4; i>=0; i--)
        push(&start, &arr[i], int_size);
    printf("Created integer linked list is \n");
    printList(start, printInt);

    // Create and print a float linked list
    unsigned float_size = sizeof(float);
    start = NULL;
    float arr2[] = {10.1, 20.2, 30.3, 40.4, 50.5};
    for (i=4; i>=0; i--)
        push(&start, &arr2[i], float_size);
    printf("\n\nCreated float linked list is \n");
    printList(start, printFloat);

    return 0;
}
```

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Output:

```
Created integer linked list is
10 20 30 40 50
```

```
Created float linked list is
10.100000 20.200001 30.299999 40.400002 50.500000
```

This article is contributed by **Himanshu Gupta**. Please write comments if you find anything incorrect, or you want to share more information about the topic discussed above.



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