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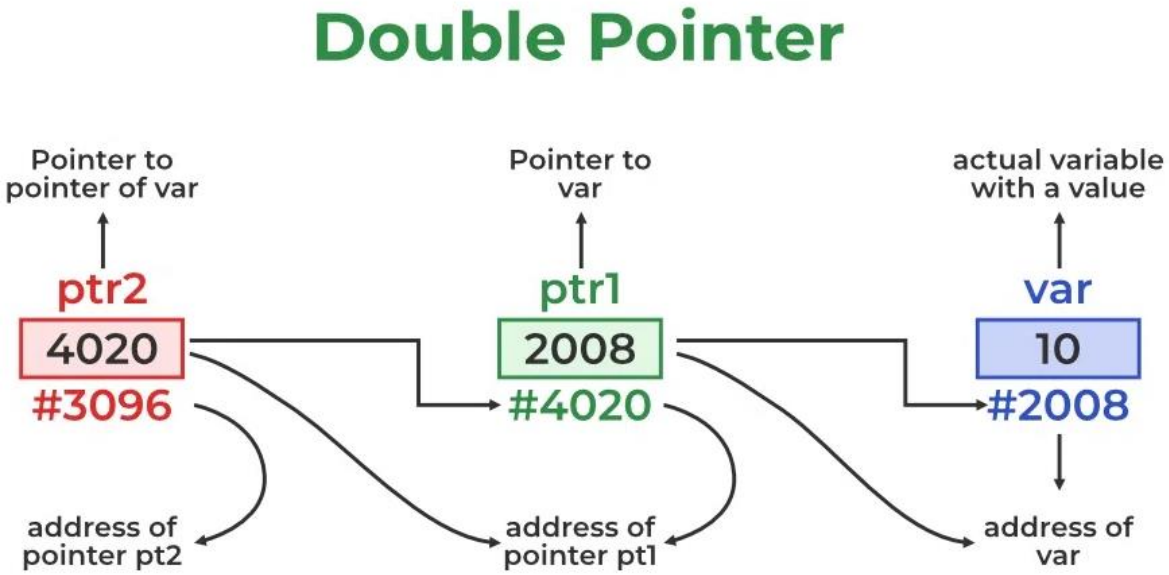
**Programme: Computer Engineering** **Semester: II**

**Course: Programming in C** **Course code: PRC238912**

# Pointer to Pointer (Double Pointer)

The pointer to a pointer in C is used when we want to store the address of another pointer. The first pointer is used to store the address of the variable. And the second pointer is used to store the address of the first pointer. That is why they are also known as **double-pointers**.

We can use a pointer to a pointer to change the values of normal pointers or create a variable-sized 2-D array. A double pointer occupies the same amount of space in the memory stack as a normal pointer.




**Declaration of Pointer to a Pointer in C**

Declaring Pointer to Pointer is similar to declaring a pointer in C. The difference is we have to place an additional '*' before the name of the pointer.

data_type_of_pointer **name_of_variable = & normal_pointer_variable;

```
int val = 5;
int *ptr = &val;
int **d_ptr = &ptr;
```

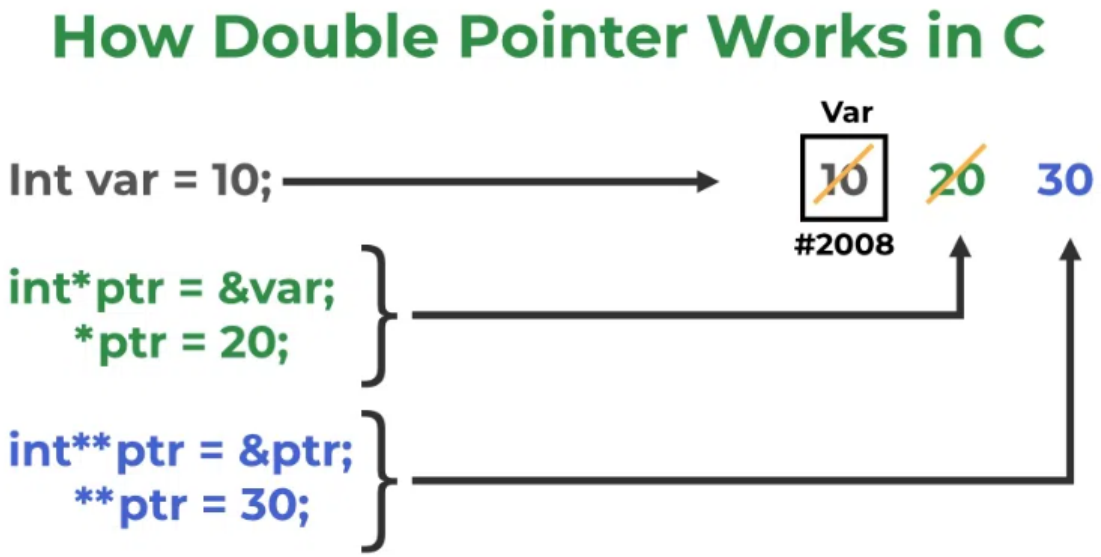
**Example of Double Pointer in C**

```
#include <stdio.h>
 void main()
{
    int var = 789;

    int* ptr2;

    int** ptr1;

    ptr2 = &var;

    ptr1 = &ptr2;

    printf("Value of var = %d\n", var);
    printf("Value of var using single pointer = %d\n", *ptr2);
    printf("Value of var using double pointer = %d\n", **ptr1);


}
```

# Output

Value of var = 789
Value of var using single pointer = 789
Value of var using double pointer = 789

**How Double Pointer Works?**




The working of the double-pointer can be explained using the above image:

- The double pointer is declared using the syntax shown above.
- After that, we store the address of another pointer as the value of this new double pointer.
- Now, if we want to manipulate or dereference to any of its levels, we have to use Asterisk ( * ) operator the number of times down the level we want to go.

## Application of Double Pointers in C

Following are the main uses of pointer to pointers in C:

- They are used in the dynamic memory allocation of multidimensional arrays.
- They can be used to store multilevel data such as the text document paragraph, sentences, and word semantics.
- They are used in data structures to directly manipulate the address of the nodes without copying.
- They can be used as function arguments to manipulate the address stored in the local pointer.