

Dynamic Memory Allocation in C using malloc(), calloc(), free() and realloc()

Why learning C Programming is a must?

Commonly Asked C Programming Interview Questions | Set 3

"static const" vs "#define" vs "enum"

Sum of array Elements without using loops and recursion

Difference between Call by Value and Call by Reference

GDB (Step by Step Introduction)

Difference between const int\*, const int \* const, and int const \*

Loader in C/C++

Difference between C and C++

Code Optimization Technique (logical AND and logical OR)

Inline function in C

Dividing a Large file into Separate Modules in C/C++, Java and Python

Interesting facts about C Language

## Is sizeof for a struct equal to the sum of sizeof of each member?

Prerequisite : [sizeof operator in C](#)

The sizeof for a struct is not always equal to the sum of sizeof of each individual member. This is because of the padding added by the compiler to avoid alignment issues. Padding is only added when a structure member is followed by a member with a larger size or at the end of the structure.

Different compilers might have different alignment constraints as C standards state that alignment of structure totally depends on the implementation.

Let's take a look at the following examples for better understanding:

### • Case 1:

```
// C program to illustrate
// size of struct
#include <stdio.h>

int main()
{
    struct A {

        // sizeof(int) = 4
        int x;
        // Padding of 4 bytes

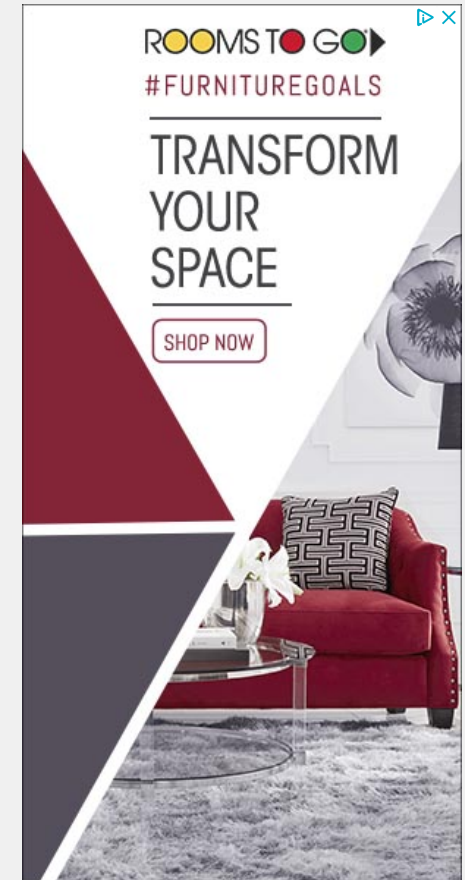
        // sizeof(double) = 8
        double z;

        // sizeof(short int) = 2
        short int y;
        // Padding of 6 bytes
    };

    printf("Size of struct: %d", sizeof(struct A));

    return 0;
}
```

Output:



Difference between scanf() and gets() in C

C program to store Student records as Structures and Sort them by Name

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Find the Nth term of the series 14, 28, 20, 40,.....

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Program to copy the contents of one array into another in the reverse order

Difference between C and Python

Difference between Structure and Array in C

Program to check if two strings are same or not

C program to check if a given string is Keyword or not

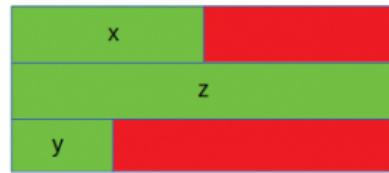
Compiling with g++

Difference between Java and C language

Lex program to count the number of lines, spaces and tabs

Program to Print Mirrored Hollow Parallelogram

Size of struct: 24



The red portion represents the padding added for data alignment and the green portion represents the struct members. In this case, x (int) is followed by z (double), which is larger in size as compared to x. Hence padding is added after x. Also, padding is needed at the end for data alignment.

- Case 2:

```
// C program to illustrate
// size of struct
#include <stdio.h>

int main()
{
    struct B {
        // sizeof(double) = 8
        double z;

        // sizeof(int) = 4
        int x;

        // sizeof(short int) = 2
        short int y;
        // Padding of 2 bytes
    };

    printf("Size of struct: %d", sizeof(struct B));

    return 0;
}
```

Output:

Size of struct: 16

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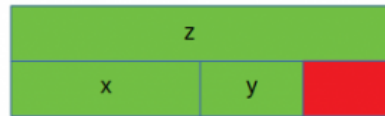
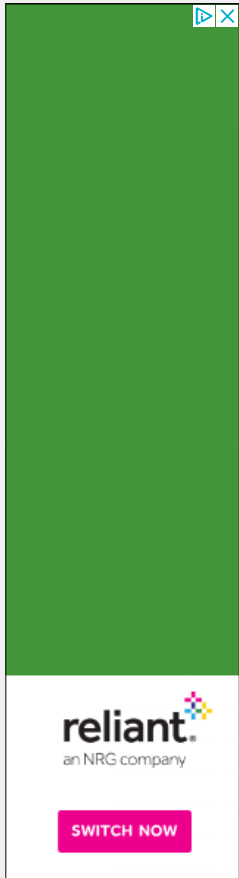
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Thread functions in C/C++

Commonly used String functions in C/C++ with Examples



In this case, the members of the structure are sorted in decreasing order of their sizes. Hence padding is required only at the end.

• Case 3:

```
// C program to illustrate
// size of struct
#include <stdio.h>

int main()
{
    struct C {
        // sizeof(double) = 8
        double z;

        // sizeof(short int) = 2
        short int y;
        // Padding of 2 bytes

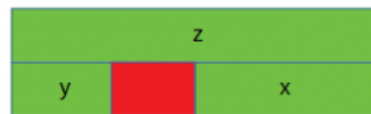
        // sizeof(int) = 4
        int x;
    };

    printf("Size of struct: %d", sizeof(struct C));

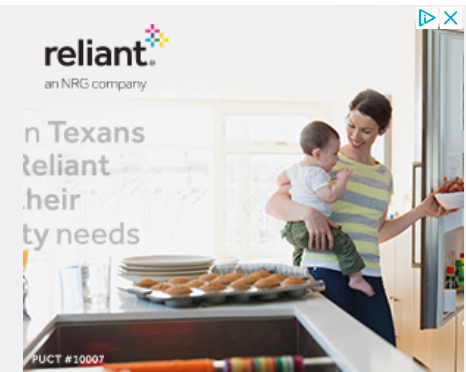
    return 0;
}
```

Output:

Size of struct: 16



In this case, y (short int) is followed by x (int) and hence padding is required after y. No padding is needed at the end in this case for data alignment.



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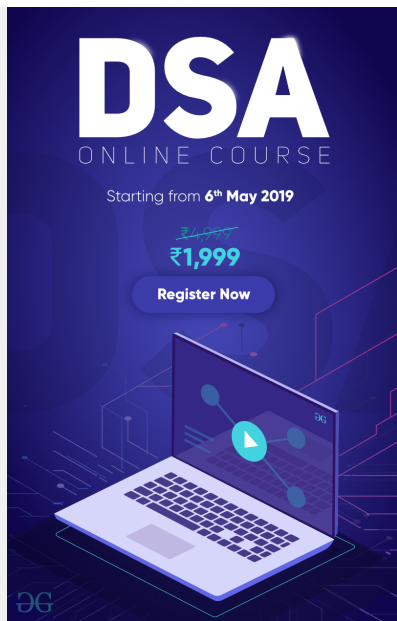
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C language doesn't allow the compilers to reorder the struct members to reduce the amount of padding. In order to minimize the amount of padding, the struct members must be sorted in a descending order (similar to the case 2).

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