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TUTORIAL

Pointer Arithmetic with Pointers

Chapter

1. Pointer Arithmetic with Pointers

If we subtract the values of two pointers, it is still valid to do so. like in following program: -

C

```c
#include <stdio.h>
int main()
{
  int arr[10]={0,1,2,3,4,5,6,7,8,9} ;
  int *p1 = arr + 2 ;
  int *p2 = arr + 5 ;
  printf("p1=%p p2=%p and p2-p1=%ld \n",p1,p2,p2-p1);
  return 0;
}

```

C++

```cpp
#include<iostream>
using namespace std;

int main()
{
  int arr[10]={0,1,2,3,4,5,6,7,8,9} ;
  int *p1 = arr + 2 ;
  int *p2 = arr + 5 ;
```

```
  cout<<"p1="<<p1<<" p2="<<p2<<" and p2-p1="<<p2-p1<<endl;
  return 0;
}
```

The output of above program is: -

```
p1=0xbfef0a58 p2=0xbfef0a64 and p2-p1=3
```

It shows that subtracting pointers is actually results in the offset in the memory between two pointers. Similarly, you can subtract or add an integral number to/from a pointer as shown in previous programs, which means "move the pointer up or down". Whereas, **Adding a pointer to a pointer** is something which is not expected. The problem is “What would the resulting pointer represent?”. The result of adding two pointers may go out of bounds hence not allowed in C/C++. If still you need to add two pointers value and access the memory then you can cast the two pointers to int, add these ints, and cast back to a pointer. Although, it is very dangerous, so you have to take care of it, but it is rarely required.

In general, you can make a pointer point anywhere. For example, **arr + 100** is valid, even if the array has only ten elements. **arr - 100** is also valid. That is, you can compute it, and it won't crash your program. However, *dereferencing* pointers to invalid memory causes problems. Thus, ***(arr - 1000)** may crash because you are trying to access the address.

Take the following scenario: “You can write down anyone's address on a piece of paper, you are free to do so, however, you can't just go inside the person's house at that address (which is like dereferencing)”. Thus, computing addresses is fine, dereferencing it may cause problems if the address is not a valid address in memory. So pointer arithmetic can be dangerous.