Object Oriented Programming

Pointers

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What is a Pointer?

Pointer

It is special type of variable that holds the address of a conventional (simple) variable as a value

- **Basic Syntax:**

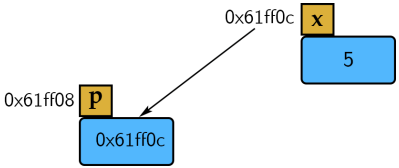
```
<data-type> * <identifier> = &<identifier>;
```

Integer Pointer Example:

```
int main() {

        int x = 5;
        int * p = &x;

        cout<<"value of x: "<<x<<endl;
        cout<<"Address of x: "<<&x<<endl;
        cout<<"value of p: "<<p<<endl;
        cout<<"Address of p: "<<&p<<endl;
        cout<<"value of *p: "<<*p<<endl;
}
```

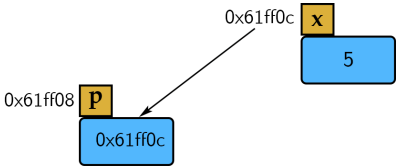
Integer Pointer Example:

```
int main() {

        int x = 5;
        int * p = &x;

        cout<<"value of x: "<<x<<endl;
        cout<<"Address of x: "<<&x<<endl;
        cout<<"value of p: "<<p<<endl;
        cout<<"Address of p: "<<&p<<endl;
        cout<<"value of *p: "<<*p<<endl;
}
```



Integer Pointer Example:

```
int main() {

        int x = 5;
        int * p = &x;

        cout<<"value of x: "<<x<<endl;
        cout<<"Address of x: "<<&x<<endl;
        cout<<"value of p: "<<p<<endl;
        cout<<"Address of p: "<<&p<<endl;
        cout<<"value of *p: "<<*p<<endl;
}
```




```
value of x: 5
Address of x: 0x61ff0c
value of p: 0x61ff0c
Address of p: 0x61ff08
value of *p: 5
```

Char Pointer Example:

```
int main() {

        char c = 'a';
        char * p = &c;

        cout<<"value of c: "<<c<<endl;
        cout<<"Size of c: "<<sizeof(c)<<endl;
        cout<<"value of *p: "<<*p<<endl;
        cout<<"Size of p: "<<sizeof(p)<<endl;
}
```

Char Pointer Example:

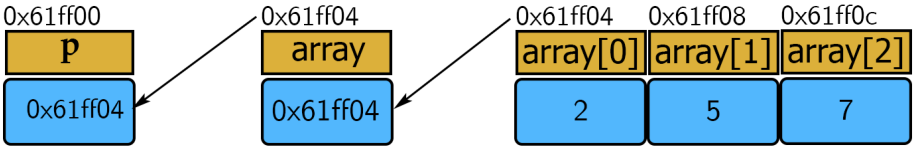
```
int main() {

        char c = 'a';
        char * p = &c;

        cout<<"value of c: "<<c<<endl;
        cout<<"Size of c: "<<sizeof(c)<<endl;
        cout<<"value of *p: "<<*p<<endl;
        cout<<"Size of p: "<<sizeof(p)<<endl;
}
```

```
value of c: a
Size of c: 1
value of *p: a
Size of p: 4
```

Pointer Vs Array

An Array name without indices

It points to the address of the first index of the array



Pointer Vs Array Example:

```
int main() {
        int array[3] = {2, 5, 7};
        int * p;
        cout<<"&array = "<<&array<<endl;
        cout<<"array = "<<array<<endl;
        cout<<"&array[0] = "<<&array[0]<<endl;
        cout<<"array[0] = "<<array[0]<<endl;
        cout<<"&array[1] = "<<&array[1]<<endl;
        cout<<"array[1] = "<<array[1]<<endl;
        cout<<"&array[2] = "<<&array[2]<<endl;
        cout<<"array[2] = "<<array[2]<<endl;
        cout<<"\np = array"<<endl; p = array;
        cout<<"\np = "<<p<<endl;
        cout<<"*p = "<<*p<<endl;
        cout<<"\np++; "<<endl; p++;
        cout<<"p = "<<p<<endl;
        cout<<"*p = "<<*p<<endl;
        cout<<"\np++; "<<endl; p++;
        cout<<"p = "<<p<<endl;
        cout<<"*p = "<<*p<<endl;
}
```

```
&array = 0x61ff04
array = 0x61ff04
&array[0] = 0x61ff04
array[0] = 2
&array[1] = 0x61ff08
array[1] = 5
&array[2] = 0x61ff0c
array[2] = 7

p = array
&p = 0x61ff00

p = 0x61ff04
*p = 2

p++
p = 0x61ff08
*p = 5

p++
p = 0x61ff0c
*p = 7
```

The new Keyword

The new Keyword

It is used to store a value in the memory than can be accessed using a pointer only. It is also used to allocate the size an array size dynamically during the run time.

1. **Single Pointer Syntax:**

```
<data-type> * <identifier> = new <data-type>;
```

2. **Array Pointer Syntax:**

```
<data-type> * <identifier> = new <data-type>[<array-size>];
```

The new Keyword Example 1

```
int main() {
        int * x = new int;

        *x = 1 ;

        cout<<"\n&x = "<<&x<<endl;
        cout<<"x = "<<x<<endl;
        cout<<"*x = "<<*x<<endl;

        delete x;
}
```

```
&x = 0x61ff08
x = 0x1096d60
*x = 1
```

The new Keyword Example 2

```
int main() {
        int * array = new int[3];

        array[0] = 2;
        array[1] = 5;
        array[3] = 7;

        cout<<"&array = "<<&array<<endl;
        cout<<"array = "<<array<<endl;
        cout<<"&array[0] = "<<&array[0]<<endl;
        cout<<"array[0] = "<<array[0]<<endl;
        cout<<"&array[1] = "<<&array[1]<<endl;
        cout<<"array[1] = "<<array[1]<<endl;
        cout<<"&array[2] = "<<&array[2]<<endl;
        cout<<"array[2] = "<<array[2]<<endl;

        delete array;
```

```
&array = 0x61ff0c
array = 0xff6d48
&array[0] = 0xff6d48
array[0] = 2
&array[1] = 0xff6d4c
array[1] = 5
&array[2] = 0xff6d50
array[2] = 7
```

The new Keyword Example 3

```
int main() {
        int * array = new int;

        *array = 2;
        cout<<"array = "<<array<<endl;
        cout<<"*array = "<<*array<<endl;

        array++;
        *array = 5;
        cout<<"array = "<<array<<endl;
        cout<<"*array = "<<*array<<endl;

        array++;
        *array = 7;
        cout<<"array = "<<array<<endl;
        cout<<"*array = "<<*array<<endl;
        delete [] array;
}
```

```
array = 0x12c6d48
*array = 2
array = 0x12c6d4c
*array = 5
array = 0x12c6d50
*array = 7
```