C/C++ Program Design

LAB 4

CONTENTS

- Learn to create and use pointers
- Learn to manage dynamic memory

2 Knowledge Points

2.1 Pointers

2.2 Dynamic memory management

2.1 Pointers

Pointer is a special type who holds the address of value.

lab04_examples > C varaddress.c > main()

```c
#include <stdio.h>

int main()
{
    int var1 = 3;
    float var2 = 24.8f;
    double var3 = 23.42;

    printf("Address of var1 is:%p,its value is:%d\n",&var1,var1);
    printf("Address of var2 is:%p,its value is:%f\n",&var2,var2);
    printf("Address of var3 is:%p,its value is:%lf\n",&var3,var3);

    return 0;
}
```

%p specifier is for address

var1 is a variable, **&var1** gives its address.

```
maydlee@LAPTOP-U1MO0N2F:/mnt/d/mycode/CcodeVS/lab04_examples$ gcc varaddress.c
maydlee@LAPTOP-U1MO0N2F:/mnt/d/mycode/CcodeVS/lab04_examples$ ./a.out
Address of var1 is:0x7ffe6f0fe138,its value is:3
Address of var2 is:0x7ffe6f0fe13c,its value is:24.799999
Address of var3 is:0x7ffe6f0fe140,its value is:23.420000
```

The 0x in the beginning represents the address in hexadecimal form.

lab04_examples > varaddress.cpp > ...

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

int main()
{
    int var1 = 3;
    float var2 = 24.8f;
    double var3 = 23.42;

    cout << "Address of var1 is:" << &var1 << ",its value is:" << var1 << endl;
    cout << "Address of var2 is:" << &var2 << ",its value is:" << var2 << endl;
    cout << "Address of var3 is:" << &var3 << ",its value is:" << var3 << endl;

    return 0;
}

```

Output the address directly using **cout**

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

```
maydlee@LAPTOP-U1MO0N2F:/mnt/d/mycode/CcodeVS/lab04_examples$ g++ varaddress.cpp
maydlee@LAPTOP-U1MO0N2F:/mnt/d/mycode/CcodeVS/lab04_examples$ ./a.out
Address of var1 is:0x7ffc834450d8,its value is:3
Address of var2 is:0x7ffc834450dc,its value is:24.8
Address of var3 is:0x7ffc834450e0,its value is:23.42
```

Declaring a pointer

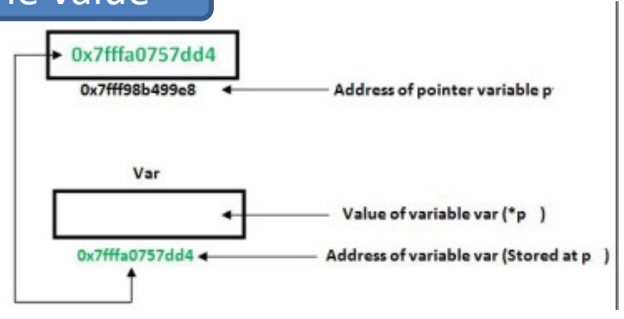
```cpp
#include <iostream>
using namespace std;

int main()
{
    /* This pointer p can hold the address of an integer
     * variable, here p is a pointer and var is just a
     * simple integer variable.
     */
    int *p, var;

    /* This is how you assign the address the address of another
     * variable to t
     */
    p = &var;

    // This will print the address of variable var
    cout << &var;

    /* This will also print the address of variable var
     * because the pointer p holds the address of var
     */
    cout << p;

    /* This will print the value of var.This is how we
     * access the value of variable through a pointer.
     */
    cout << *p;

    return 0;
}
```

Declare a pointer, data type must be specified to which the pointer points

Assign an address of a variable to the pointer, the data type of the variable must be the same as data type indicated by the pointer

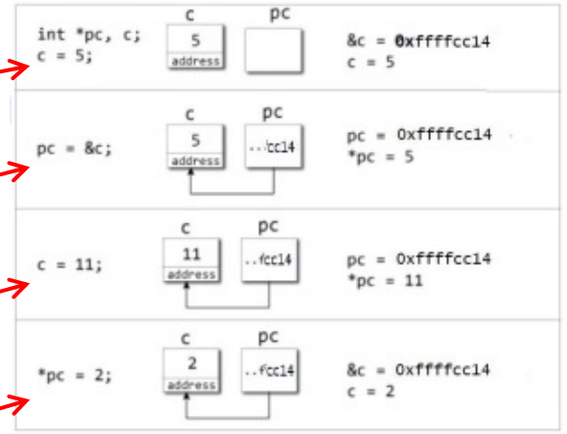
Use the pointer to access the address

Use the ***pointer** to access the value



lab04_examples > pointer.cpp > main()

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

int main()
{
    int *pc, c;

    c = 5;
    cout << "Address of c (&c): " << &c << endl;
    cout << "Value of c (c): " << c << endl << endl;

    pc = &c;
    cout << "Address that pointer pc holds (pc) " << pc << endl;
    cout << "Content of the address pointer pc holds (*pc) " << *pc << endl << endl;

    c = 11;
    cout << "Address that pointer pc holds (pc) " << pc << endl;
    cout << "Content of the address pointer pc holds (*pc) " << *pc << endl << endl;

    *pc = 2;
    cout << "Address of c (&c): " << &c << endl;
    cout << "Value of c (c): " << c << endl << endl;

    return 0;
}
```




```
Address of c (&c): 0xffffcc14
Value of c (c): 5

Address that pointer pc holds (pc) 0xffffcc14
Content of the address pointer pc holds (*pc) 5

Address that pointer pc holds (pc) 0xffffcc14
Content of the address pointer pc holds (*pc) 11

Address of c (&c): 0xffffcc14
Value of c (c): 2
```

Note:

1. **Reference operator(&)** gives the address of a variable.
2. **Dereference operator(*)** gets the value stored in the memory address.
3. The (*) sign used the declaration of pointer is not the dereference pointer. It is just a similar notation that creates a pointer.

lab04_examples > pointersize.cpp > ...

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

int main()
{
    char *pc, cc = 'A';
    int *pi, ii = 10;
    float *pf, ff = 23.4f;
    double *pd, dd = 123.78;

    pc = &cc;
    pi = &ii;
    pf = &ff;
    pd = &dd;

    cout << "The size of cc is: " << sizeof(cc) << " byte,  the size of pc is:" << sizeof(pc) << " bytes." << endl;
    cout << "The size of ii is: " << sizeof(ii) << " bytes, the size of pi is:" << sizeof(pi) << " bytes." << endl;
    cout << "The size of ff is: " << sizeof(ff) << " bytes, the size of pf is:" << sizeof(pf) << " bytes." << endl;
    cout << "The size of dd is: " << sizeof(dd) << " bytes, the size of pd is:" << sizeof(pd) << " bytes." << endl;

    cout << "The address of pc is:" << &pc << ",the address of cc is:" << (void*)(pc) << ",its value is:" << *pc << endl;
    cout << "The address of pi is:" << &pi << ",the address of ii is:" << pi << ",its value is:" << *pi << endl;
    cout << "The address of pf is:" << &pf << ",the address of ff is:" << pf << ",its value is:" << *pf << endl;
    cout << "The address of pd is:" << &pd << ",the address of dd is:" << pd << ",its value is:" << *pd << endl;

    return 0;
}
```

```
The size of cc is: 1 byte,  the size of pc is:8 bytes.
The size of ii is: 4 bytes, the size of pi is:8 bytes.
The size of ff is: 4 bytes, the size of pf is:8 bytes.
The size of dd is: 8 bytes, the size of pd is:8 bytes.
The address of pc is:0x7fff6aa68c30,the address of cc is:0x7fff6aa68c27,its value is:A
The address of pi is:0x7fff6aa68c38,the address of ii is:0x7fff6aa68c28,its value is:10
The address of pf is:0x7fff6aa68c40,the address of ff is:0x7fff6aa68c2c,its value is:23.4
The address of pd is:0x7fff6aa68c48,the address of dd is:0x7fff6aa68c50,its value is:123.78
```

or static_cast<void *> (pc)

Pointer and structure

lab04_examples > pointer_structure.cpp > ...

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

struct Distance
{
    int feet;
    double inch;
};

int main()
{
    Distance *ptr, d;
    ptr = &d;

    cout << "Enter feet: ";
    cin >> (*ptr).feet;
    cout << "Enter inch: ";
    cin >> ptr->inch;

    cout << "Displaying information:" << endl;
    cout << "Distance = " << (*ptr).feet << " feet " << ptr->inch << " inches." << endl;

    cout << "The size of d is: " << sizeof(d) << " bytes." << endl;
    cout << "The size of ptr is:" << sizeof(ptr) << " bytes." << endl;

    return 0;
}
```

Creates a pointer **ptr** of type structure Distance.

ptr must pointe to the Distance variable.

These two ways can both access the members of structure, but **-> notation** is more common.

```
Enter feet: 4
Enter inch: 3.5
Displaying information:
Distance = 4 feet 3.5 inches.
The size of d is: 16 bytes.
The size of ptr is:8 bytes.
```

Note: Since pointer ptr is pointed to variable d in this program, (*ptr).inch ,ptr->inch and d.inch are exact the same.

Pointer and array

lab04_examples > pointer_array.cpp > main()

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

int main()
{
    float arr[5];
    float *ptr;

    cout << "Displaying address using array: " << endl;
    for(int i = 0; i < 5; i++)
        cout << "&arr[" << i << "] = " << &arr[i] << endl;

    ptr = arr;
    cout << "\nDisplaying address using pointer:" << endl;
    for(int i =0; i < 5; i++)
        cout << "ptr + " << i << " = " << ptr + i << endl;

    for(int i = 0; i < 5; i++)
        arr[i] = i * 2;

    cout << "\nDisplaying values of elements using pointer:" << endl;
    for(int i =0; i < 5; i++)
        cout << "*(ptr + " << i << ") = " << *(ptr + i) << endl;

    cout << "\nThe sizeof arr is: " << sizeof(arr) << " bytes." << endl;
    cout << "The sizeof ptr is: " << sizeof(ptr) << " bytes." << endl;

    return 0;
}
```

Access the address of each element by array.

ptr pointes to the array.

Access the address of each element by pointer.

Access the values of elements by pointer using * operator.

```
Displaying address using array:
&arr[0] = 0x7ffd870fd300
&arr[1] = 0x7ffd870fd304
&arr[2] = 0x7ffd870fd308
&arr[3] = 0x7ffd870fd30c
&arr[4] = 0x7ffd870fd310

Displaying address using pointer:
ptr + 0 = 0x7ffd870fd300
ptr + 1 = 0x7ffd870fd304
ptr + 2 = 0x7ffd870fd308
ptr + 3 = 0x7ffd870fd30c
ptr + 4 = 0x7ffd870fd310

Displaying values of elements using pointer:
*(ptr + 0) = 0
*(ptr + 1) = 2
*(ptr + 2) = 4
*(ptr + 3) = 6
*(ptr + 4) = 8

The sizeof arr is: 20 bytes.
The sizeof ptr is: 8 bytes.
```

Pointer and string

lab04_examples > pointer_string.cpp > main()

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

int main()
{
    const char *msg = "C/C++ programming is fun.";
    const char *copy;

    copy = msg;

    cout << "msg = " << msg << ",its address is: " << (void*)msg << ", &msg = " << &msg << endl;
    cout << "copy= " << copy << ",its address is: " << (void*)copy << ", &copy= " << &copy << endl;

    return 0;
}
```

const means the program can not change the string, because the pointer is initialized with constant string or string literal, the **const** is recommended, otherwise a warning is given when compiling.

```
msg = C/C++ programming is fun.,its address is: 0x55b2f80da005, &msg = 0x7ffe17fcf598
copy= C/C++ programming is fun.,its address is: 0x55b2f80da005, &copy= 0x7ffe17fcf5a0
```

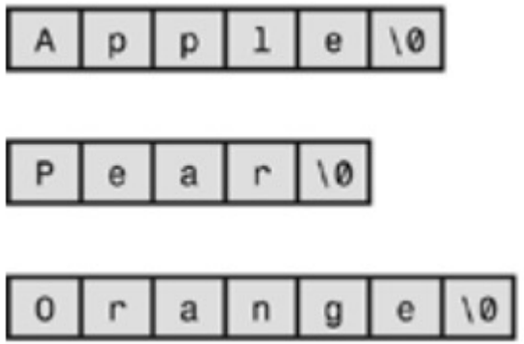
These two values are equal, indicates both of the pointers are pointed to the same string, although their own address are different.

Pointer array: each element in the array is a pointer.

char fruit1[3][7] = { “Apple”, “Pear”, “Orange”};

fruit1 is an array of three elements, and each of these elements is itself an array of 7 char values with all the rows of the same length. In short, fruit1 is an array of arrays of char and is stored consecutively in memory.

const char *fruit2[3] = { “Apple”, “Pear”, “Orange”};



fruit2 is an array of three pointers-to-char, each element doesn’t necessarily have to be stored consecutively in memory. It sets up a ragged array.

lab04_examples > arrayofpointer.cpp > ...

```cpp
#include <iomanip>
#include <cstring>
using namespace std;

int main()
{
    char sports[3][20] = {"Table tennis","Football","Swimming"};
    const char *books[3] = {"Algorithms","C++ programming","Design patterns"};


    cout << setw(10) << "Sports" << setw(20)  << "Books" << endl;
    for(int i = 0; i < 3; i++)
        cout << sports[i]  << setw(35 - strlen(sports[i]))  << books[i] << endl;

    cout << "The size of sports is: " << sizeof(sports) << ",the size of books is:" << sizeof(books) << endl;

    return 0;
}
```

Define and initialize an array of pointer

Use index to access the element of the pointer array

```
    Sports                Books
Table tennis              Algorithms
Football            C++ programming
Swimming            Design patterns
The size of sports is: 60,the size of books is:24
```

String functions

#include <cstring>

- `char *strcpy(char * s1, const char * s2);`

  This function copies the string (including the null character) pointed to by `s2` to the location pointed to by `s1`. The return value is `s1`.

- `char *strncpy(char * s1, const char * s2, size_t n);`

  This function copies to the location pointed to by `s1` no more than `n` characters from the string pointed to by `s2`. The return value is `s1`. No characters after a null character are copied and, if the source string is shorter than `n` characters, the target string is padded with null characters. If the source string has `n` or more characters, no null character is copied. The return value is `s1`.

- `char *strcat(char * s1, const char * s2);`

  The string pointed to by `s2` is copied to the end of the string pointed to by `s1`. The first character of the `s2` string is copied over the null character of the `s1` string. The return value is `s1`.

- `char *strncat(char * s1, const char * s2, size_t n);`

  No more than the first `n` characters of the `s2` string are appended to the `s1` string, with the first character of the `s2` string being copied over the null character of the `s1` string. The null character and any characters following it in the `s2` string are not copied, and a null character is appended to the result. The return value is `s1`.

- `int strcmp(const char * s1, const char * s2);`

  This function returns a positive value if the `s1` string follows the `s2` string in the machine collating sequence, the value `0` if the two strings are identical, and a negative value if the first string precedes the second string in the machine collating sequence.

- `int strncmp(const char * s1, const char * s2, size_t n);`

  This function works like `strcmp()`, except that the comparison stops after `n` characters or when the first null character is encountered, whichever comes first.

- `char *strchr(const char * s, int c);`

  This function returns a pointer to the first location in the string `s` that holds the character `c`. (The terminating null character is part of the string, so it can be searched for.) The function returns the null pointer if the character is not found.

- `size_t strlen(const char * s);`

  This function returns the number of characters, not including the terminating null character, found in the string `s`.

type unsigned int size_t;

2.2 Dynamic Memory

2.2.1 C Dynamic Memory

These functions can be found in the **<stdlib.h>** header file.

Sr.No.	Function	Description
1	**void *calloc(int num, int size);**	This function allocates an array of **num** elements each of which size in bytes will be **size**.
2	**void free(void *address);**	This function releases a block of memory block specified by address.
3	**void *malloc(int num);**	This function allocates an array of **num** bytes and leave them uninitialized.
4	**void *realloc(void *address, int newsize);**	This function re-allocates memory extending it upto **newsize**.

When you are not in need of memory any more, you should release that memory by calling the function **free().**

1. Allocating Memory Dynamically

When you declare an array, you must specify the number of the elements. Sometimes you don't know the amount of the elements, you can declare a pointer, and let it point to the memory which allocated dynamically.

lab04_examples > C allocateMemory.c

```c
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

int main()
{
    char name[100];
    char *description;

    strcpy(name, "Zara Ali");

    /* allocate memory dynamically */
    description = (char *)malloc(200 * sizeof(char));
    if(description == NULL)
    {
        fprintf(stderr, "Error- unable to allocate required memory.\n");
    }
    else
    {
        strcpy(description, "Zara Ali is a DPS student in class 10.");
    }
    printf("Name = %s\n", name);
    printf("Description: %s\n", description);

    free(description);

    return 0;
}
```

Declare an array with 100 elements.

Declare a pointer.

Let the pointer point to the memory.

You can use **calloc(200, sizeof(char))** to replace malloc function.

Copy a string to the memory.

Release the memory.

```
Name = Zara Ali
Description: Zara Ali is a DPS student in class 10.
```

2. Resizing Memory

You can increase or decrease the size of an allocated memory block by calling the function realloc().

lab04_examples > C reallocateMemory.c > ...

```c
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

int main()
{
    char name[100];
    char *description;

    strcpy(name, "Zara Ali");

    /* allocate memory dynamically */
    description = (char *)malloc(30 * sizeof(char));
    if(description == NULL)
        fprintf(stderr, "Error- unable to allocate required memory.\n");
    else
        strcpy(description, "Zara Ali is a DPS student.");

    /* suppose you want to store a bigger description */
    description = (char *)realloc(description,100 * sizeof(char));
    if(description == NULL)
        fprintf(stderr, "Error- unable to allocate required memory.\n");
    else
        strcat(description, "She is in class 10.");

    printf("Name = %s\n", name);
    printf("Description: %s\n", description);

    free(description);
    return 0;
}
```

Resizing the memory.

Concatenate the string.

Release the memory.

```
Name = Zara Ali
Description: Zara Ali is a DPS student.She is in class 10.
```

2.2.2 C++ Dynamic Memory

1. new and delete Operators

new data-type;

Use **new** operator to allocate memory dynamically for any data-type.

data-type could be any built-in data type including an array or any user defined data types such as structure or class.

delete pointer variable;

Use **delete** operator to de-allocate memory that was previously allocated by new operator.

lab04_examples > newdouble.cpp > ...

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

int main() {
    double *pvalue = NULL;   //Pointer initial with null
    pvalue = new double;     // Request memory for the variable

    *pvalue = 1294948.98;    // Store value at all allocated address

    cout << "Value of pvalue: " << *pvalue << endl;

    delete pvalue;       // Free up the memory

    return 0;
}
```

```
Value of pvalue: 1.29495e+06
```

2. Dynamic Memory Allocation for Arrays

newarray.cpp > ...

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

int main()
{
    int * pArray = NULL ,*t ;
    pArray = new int [10] ;
    if ( pArray == NULL )
    { cout << "allocation failure.\n" ;
      exit(0) ;
    }
    for ( int i = 0 ; i < 10 ; i ++ )
        pArray[i] = 100 + i ;

    cout << "Displaying the Array Content" << endl;
    for ( t = pArray ; t < pArray + 10 ; t ++ )
        cout << *t << "  " ;

    delete [] pArray ;

    return 0;
}
```

Allocate the memory to store 10 integers, and assign its address to the pointer **pArray**.

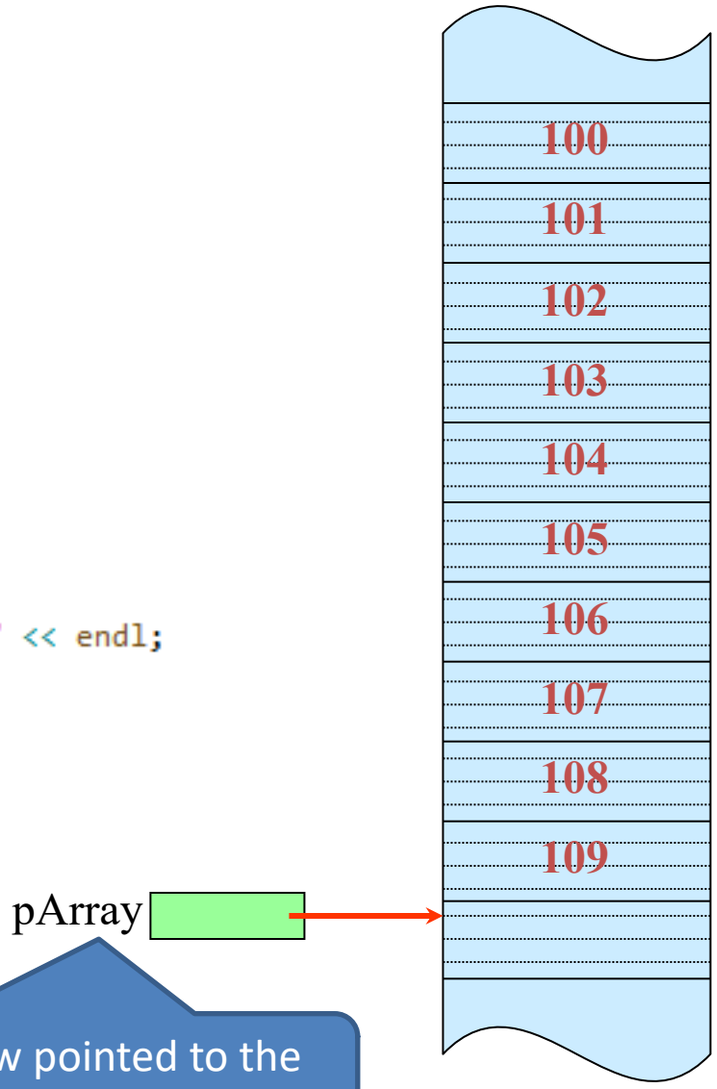
Assign 10 values to the memory by the pointer **pArray**.

If you access the value by * operator, be sure do not move the pointer which assign the address by new.

Release the memory.

```
Displaying the Array Content
100  101  102  103  104  105  106  107  108  109
```

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

int main()
{
    int* pArray = NULL;
    pArray = new int[10];

    if (pArray == NULL)
    {
        cout << "Allocateion failure.\n";
        exit(0);
    }

    for (int i = 0; i < 10; i++)
        pArray[i] = 100 + i;

    cout << " Displaying the Array countents:" << endl;
    for (int i = 0; i < 10; i++, pArray++)
        cout << *pArray << " ";

    delete[] pArray;

    return 0;

}
```



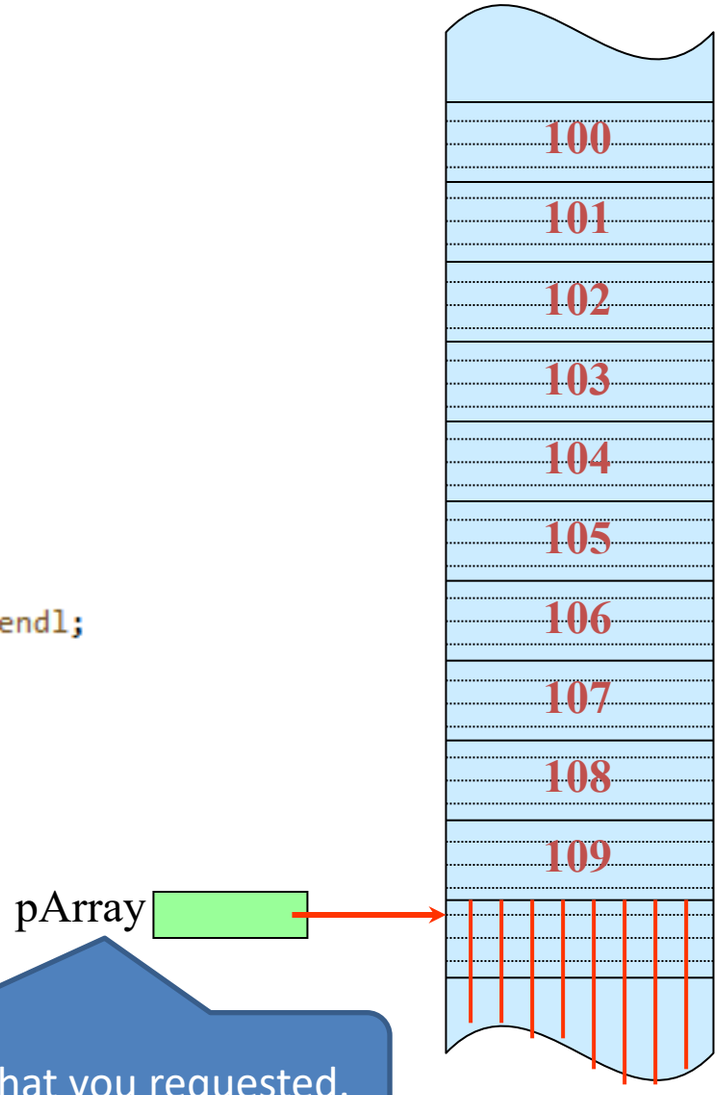
After for loop, the pointer is now pointed to the memory out of the range you have requested.

lab04_examples > memoryleak.cpp > ...

```
4   int main()
5   {
6       int *pArray = NULL;
7       pArray = new int[10];
8
9       if(pArray == NULL)
10      {
11          cout <<"Allocateion failure.\n";
12          exit(0);
13      }
14
15      for(int i = 0; i < 10; i++)
16          pArray[i] = 100 + i;
17
18      cout <<" Displaying the Array countents:" << endl;
19      for(int i = 0; i < 10; i++, pArray++)
20          cout << *pArray << " ";
21
22      delete [] pArray;
23
24      return 0;
25
26  }
```

```
Displaying the Array countents:
Segmentation fault
```

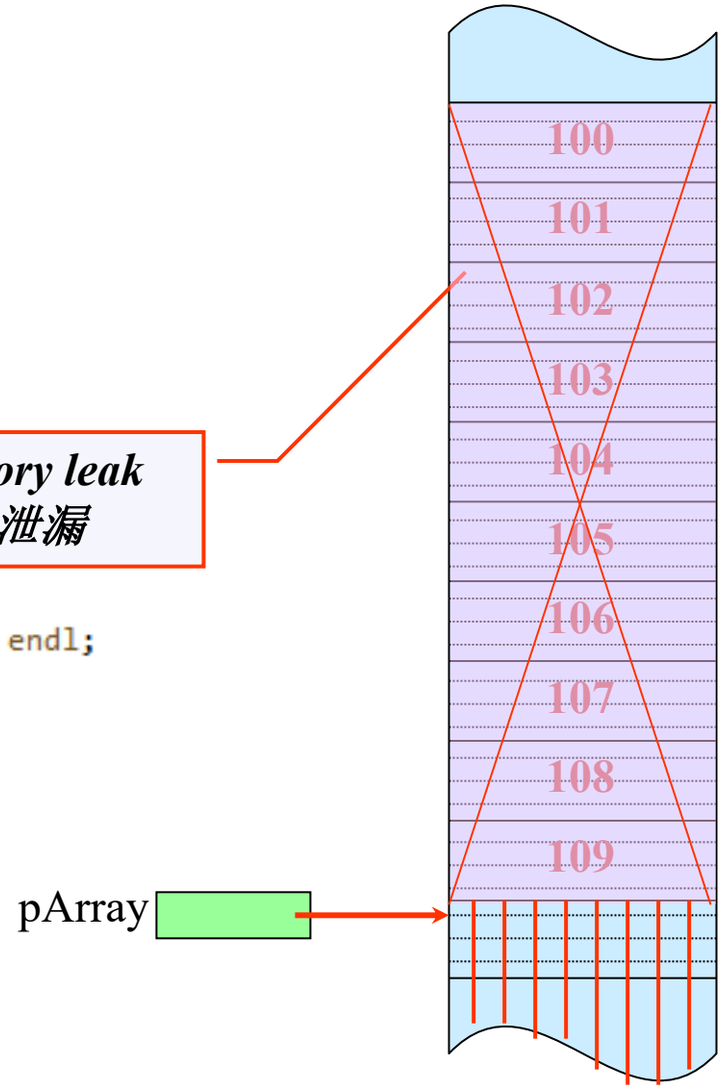
```cpp
#include <iostream>
using namespace std;

int main()
{
    int* pArray = NULL;
    pArray = new int[10];

    if (pArray == NULL)
    {
        cout << "Allocateion failure.\n";
        exit(0);
    }

    for (int i = 0; i < 10; i++)
        pArray[i] = 100 + i;

    cout << " Displaying the Array countents:" << endl;
    for (int i = 0; i < 10; i++, pArray++)
        cout << *pArray << " ";

    delete[] pArray;

    return 0;

}
```



The memory you release will not what you requested.

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

int main()
{
    int* pArray = NULL;
    pArray = new int[10];

    if (pArray == NULL)
    {
        cout << "Allocateion failure.\n";
        exit(0);
    }

    for (int i = 0; i < 10; i++)
        pArray[i] = 100 + i;

    cout << " Displaying the Array countents:" << endl;
    for (int i = 0; i < 10; i++, pArray++)
        cout << *pArray << " ";

    delete[] pArray;

    return 0;

}
```

memory leak
内存泄漏



Many times, you are not aware in advance how much memory you will need to store particular information in a defined variable, but the size of required memory can be determined at run time.

lab04_examples > dynamic_array.cpp > ...

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

int main()
{
    int n;
    cout << "How many classes did you take in last semester?";
    cin >> n;

    float *pScore = new float[n];
    float *pt = pScore;

    cout << "Input " << n << " scores:";
    for(; pt < pScore + n; pt++)
        cin >> *pt;

    cout << "The scores are:\n";
    pt = pt - n;
    for(; pt < pScore + n; pt++)
        cout << *pt << "\t";
    cout << "\n";

    delete []pScore;

    return 0;
}
```

```
How many classes did you take in last semester?5
Input 5 scores:87.3 81.5 78.9 88 90.5
The scores are:
87.3    81.5    78.9    88      90.5
```

3. Dynamic Memory Allocation for Structures

lab04_examples > newstructure.cpp > ...

```cpp
#include <iostream>
struct inflatable   // structure declaration
{
    char name[20];
    float volume;
    double price;
};

int main()
{
    using namespace std;
    inflatable *ps = new inflatable;    // allocate memory for structure

    cout << "Enter name of inflatable item: ";
    cin.get(ps->name, 20);     // use -> to access the member
    cout << "Enter volume of cubic feet: ";
    cin >> (*ps).volume;          // use (*). to access the member
    cout << "Enter price: $";
    cin >> ps->price;

    cout << "Name: " << (*ps).name << endl;
    cout << "Volume: " << ps->volume << "cubic feet\n";
    cout << "Price: $" << ps->price << endl;

    delete ps;              // free memory used by structure

    return 0;
}
```

Create an unnamed structure of the inflatable type and assign its address to **ps** pointer using **new** operator

Access the structure members using **->** or **(*).**

Release the memory.

```
Enter name of inflatable item: Black Base
Enter volume of cubic feet: 35.4
Enter price: $91.25
Name: Black Base
Volume: 35.4cubic feet
Price: $91.25
```

Structured array

lab04_examples > newstructurearray.cpp > ...

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

struct Employee
{
    string Name;
    int Age;
};

int main()
{
    Employee *DynArray;
    DynArray = new (nothrow) Employee[3];

    DynArray[0].Name = "Harvey";
    DynArray[0].Age = 33;
    DynArray[1].Name = "Sally";
    DynArray[1].Age = 26;
    DynArray[2].Name = "Jeff";
    DynArray[2].Age = 52;

    cout << "Displaying the Array Contents" << endl;
    for(int i = 0; i < 3; i++)
        cout << "Name: " << DynArray[i].Name << "\tAge: " << DynArray[i].Age << endl;

    delete [] DynArray;

    return 0;
}
```

Create an unnamed structured array of the Employee type and assign its address to **DynArray** pointer using new operator

nothrow constant, this constant value is used as an argument for [**operator new**] and [**operator new[]**] to indicate that these functions shall not throw an exception on failure, but return a *null pointer* instead.

Release the memory.

```
Displaying the Array Contents
Name: Harvey    Age: 33
Name: Sally     Age: 26
Name: Jeff      Age: 52
```

3 Exercises

1. William Wingate runs a pizza-analysis service. For each pizza, needs to record the following information:

①The name of the pizza company, which can consist of more than one word ②The diameter of the pizza ③The weight of the pizza

Devise a structure that can hold this information and write a program that use ***new*** to allocate a structure instead of declaring a structure variable of that type. The program should ask the user to enter each of the preceding items of information, and then the program should display that information.

Sample output:

```
Enter the name of pizza company: Pizza Hot
Enter the diameter of pizza (inches): 10
Enter the weight of the pizza (g): 452.5
Displaying the information of the pizza
Company name: Pizza Hot
Pizza diameter: 10 inches
Pizza weight: 452.5 g
```

2. The **CandyBar** structure contains **three** members. The first member holds the brand **name** of candy bar. The second member holds the **weight**(which may have a fractional part) of the candy bar, and the third member holds **the number of calories**(an integer value) in the candy bar.

Write a program that use ***new*** to allocate the array dynamically of three **CandyBar**. The program ask the user to enter each of the preceding items of information, and then the program should display that information.

Sample output:

```
Please input three CandyBar's information:
Enter the brand name of candy bar: Ferro Rocher
Enter the weight: 23.6
Enter the calories: 893
Enter the brand name of candy bar: Hershey's
Enter the weight: 13.2
Enter the calories: 658
Enter the brand name of candy bar: Mars Wrigley
Enter the weight: 3.2
Enter the calories: 327

Displaying the CandyBar array contents
Brand name: Ferro Rocher
Weight: 23.6
Calories: 893
Brand name: Hershey's
Weight: 13.2
Calories: 658
Brand name: Mars Wrigley
Weight: 3.2
Calories: 327
```

3. Write a C++ program to accept five integer values from keyboard:

- The five values will be stored in an array using a pointer.
- Print the elements of the array in reverse order using a pointer.

Sample output:

```
Enter 5 integers:
45 89 12 33 76
The elements of the array in reverse order are:
76  33  12  89  45
```