

Advanced Programming

ACSE-5: Lecture 4

Adriana Paluszny

Royal Society University Research Fellow

Overview

- STL Containers: iterators and algorithms
- Debug
- Object oriented programming:
 - copy constructor, members, operators
 - Encapsulation: mutators and accessors
- Inheritance
- Polymorphism

Operators

Operators in C

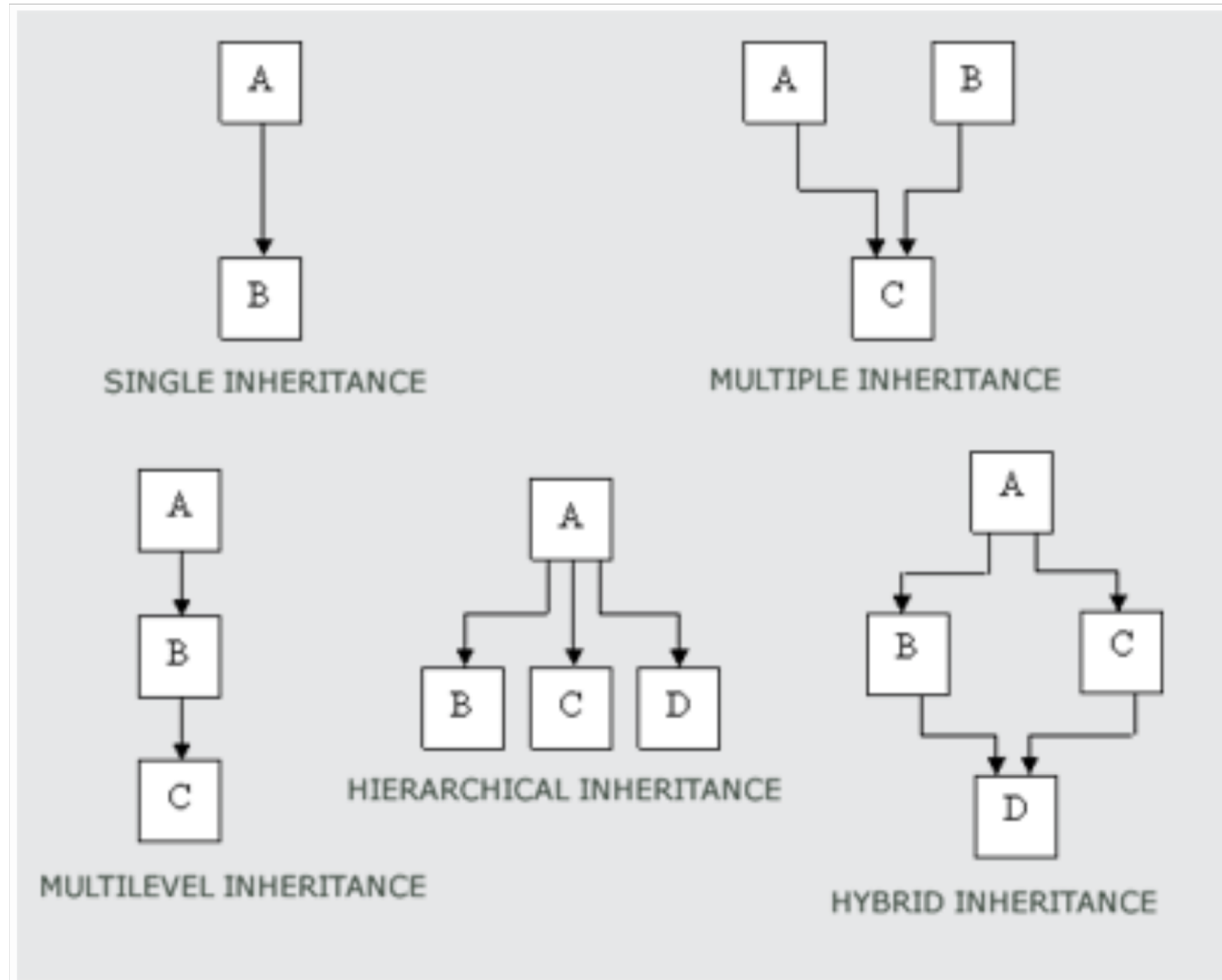
	Operator	Type
Unary operator	++, --	Unary operator
Binary operator	+, -, *, /, %	Arithmetic operator
	<, <=, >, >=, ==, !=	Relational operator
	&&, , !	Logical operator
	&, , <<, >>, ~, ^	Bitwise operator
	=, +=, -=, *=, /=, %=	Assignment operator
Ternary operator	?:	Ternary or conditional operator

Types of inheritance

Inheritance can also be:

Private
Protected
Public

Both members and functions can be inherited



Homework

- 1) **Read Chapters 7 and 8 of [Programming: Principles and Practice using C++](#)** by Bjarne Stroustrup
- 2) Introduction to the C++ grammar: **chapter 6**
- 3) Google C++ exercises (next two slides)
- 4) Finish submission of assignment!

[from google c++ developers course]

- What's the output of the following program?
Please do not run the program, but draw the memory picture to determine the output.
- Once you have determined the output by hand, run the program to see if you are correct.

```
void Unknown(int *p, int num);
void HardToFollow(int *p, int q, int *num);

void Unknown(int *p, int num) {
    int *q;

    q = &num;
    *p = *q + 2;
    num = 7;
}

void HardToFollow(int *p, int q, int *num) {
    *p = q + *num;
    *num = q;
    num = p;
    p = &q;
    Unknown(num, *p);
}

main() {
    int *q;
    int trouble[3];

    trouble[0] = 1;
    q = &trouble[1];
    *q = 2;
    trouble[2] = 3;

    HardToFollow(q, trouble[0], &trouble[2]);
    Unknown(&trouble[0], *q);

    cout << *q << " " << trouble[0] << " " << trouble[2];
}
```

[from google c++ developers course]

Consider this programme.

There is a line in this program marked "How does this line work?" - can you figure it out? Here is Google's explanation:

<https://developers.google.com/edu/c++/solutions/3-1>

Write a program that initializes a 3-dim array and fills the 3rd dimension value with the sum of all three indexes. Here is Google's solution:

<https://developers.google.com/edu/c++/solutions/3-2>

```
const int kStudents = 25;
const int kProblemSets = 10;

// This function returns the highest grade in the Problem Set array.
int get_high_grade(int *a, int cols, int row, int col) {
    int i, j;
    int highgrade = *a;

    for (i = 0; i < row; i++)
        for (j = 0; j < col; j++)
            if (*(a + i * cols + j) > highgrade) // How does this line work?
                highgrade = *(a + i*cols + j);
    return highgrade;
}

int main() {
    int grades[kStudents][kProblemSets] = {
        {75, 70, 85, 72, 84},
        {85, 92, 93, 96, 86},
        {95, 90, 83, 76, 97},
        {65, 62, 73, 84, 73}
    };
    int std_num = 4;
    int ps_num = 5;
    int highest;

    highest = get_high_grade((int *)grades, kProblemSets, std_num, ps_num);
    cout << "The highest problem set score in the class is " << highest << endl;

    return 0;
}
```