



C++ and Makefiles

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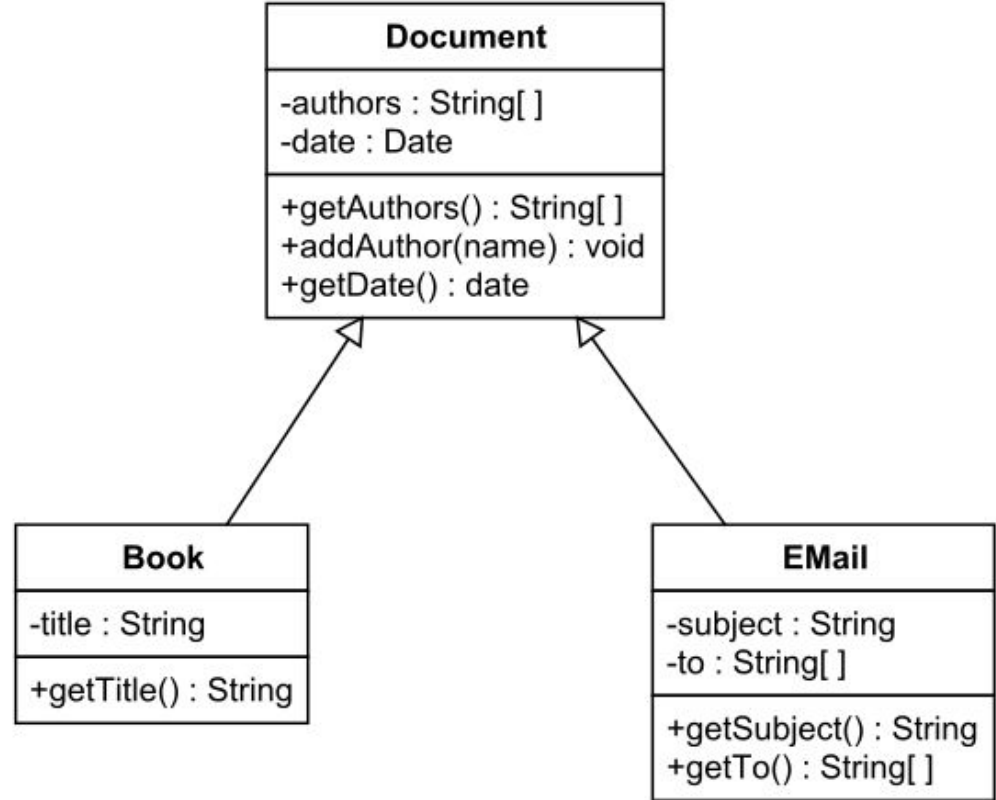
Métodos Computacionales II

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Create a project in C++

- To create a project that involves many classes is useful to draw the UML diagram.
- We show how to build projects in C++.



Define and constants

```
/* C++ #define - Example Program of #define */  
  
#include<iostream>  
  
#define PI 3.14159  
  
int main()  
{  
  
    int r = 10;  
    float cir;  
    cir = PI * (r * r);  
    std::cout<<"Area of Circle: "<<cir<< std::endl;  
    return 0;  
}
```

Preprocessor
instruction

```
Area of Circle: 314.159
```

#ifndef : of not defined

- ifndef makes a definition if it has not been previously defined

```
/* Example using #ifndef directive by TechOnTheNet.com */  
  
#include <stdio.h>  
  
#define YEARS_OLD 12  
#ifndef YEARS_OLD  
#define YEARS_OLD 10  
#endif  
  
int main()  
{  
    printf("TechOnTheNet is over %d years old.\n", YEARS_OLD);  
  
    return 0;  
}
```

TechOnTheNet is over 12 years old.

#ifndef : of not defined

- ifndef makes a definition if it has not been previously defined

```
/* Example using #ifndef directive by TechOnTheNet.com */  
  
#include <stdio.h>  
  
//#define YEARS_OLD 12  
#ifndef YEARS_OLD  
#define YEARS_OLD 10  
#endif  
  
int main()  
{  
    printf("TechOnTheNet is over %d years old.\n", YEARS_OLD);  
    return 0;  
}
```

```
TechOnTheNet is over 10 years old.
```

File guards and headers

main.cpp

```
#include <iostream>

#include "engine.h"
#include "car.h"

using namespace std;

int main()
{
    std::cout << "Vroom Vroom!\n";

    return 0;
}
```

engine.h

```
class engine{
    // code for engine
};
```

car.h

```
#include "engine.h"

class car{
    // code
};
```

```
#include <iostream>

#include "engine.h"
#include "car.h"

using namespace std;

int main()
{
    std::cout << "Vroom Vroom!\n";

    return 0;
}
```

engine.h

```
class engine{
    // code for engine
};
```

car.h

```
#include "engine.h"

class car{
    // code
};
```

- Error because engine was defined twice.

```
PaulProgramming: ls
car.h          engine.h      main.cpp
PaulProgramming: g++ main.cpp
In file included from main.cpp:4:
In file included from ./car.h:1:
./engine.h:3:7: error: redefinition of 'engine'
class engine{
^
./engine.h:3:7: note: previous definition is here
class engine{
^
1 error generated.
PaulProgramming: █
```

Solution: use ifndef

```
#ifndef ENGINE
#define ENGINE

class engine{

    // code for engine

};

#endif //
```


Function overloading

- Use function overloading to define functions for multiple input types

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

void printNumber(int x) {
    cout << "Prints an integer: " << x << endl;
}

void printNumber(float x) {
    cout << "Prints a float: " << x << endl;
}

int main() {
    int a = 16;
    float b = 54.541;
    printNumber(a);
    printNumber(b);
}
```

Makefile

- Uses :
 - To perform multiple shell instructions.
 - To compile a C++ program with multiple files and classes.
- Syntax

```
targets: prerequisites  
    command  
    command  
    command
```

- Example

```
hello:  
    echo "hello world"
```

Makefile

- Syntax

```
targets: prerequisites
    command
    command
    command
```

- Example

```
main.o: main.cpp
    g++ -c main.cpp

message.o: message.cpp message.h
    g++ -c message.cpp

output: main.cpp message.cpp
    g++ main.o message.o -o output
```

References

<https://codescracker.com/cpp/cpp-hash-define-preprocessor-directive.htm>

www.sololearn.com

https://www.techonthenet.com/c_language/directives/ifndef.php

https://www.youtube.com/watch?v=RU5JUHAiR18&ab_channel=PaulProgramming

<https://makefiletutorial.com/>

https://www.youtube.com/watch?v=_r7i5X0rXJk&ab_channel=PaulProgramming

<http://www.cs.utsa.edu/~cs3443/uml/uml.html>