C++:
Header Files, Namespaces

Header File - Overview

Break up large files, Speeds compilation process

Organizes code

Separates interface from implementation

(and reduces your need to know what goes on ‘under the hood’)

But adds slight complexity

Header File Rules –
1. YOU MUST USE INCLUDE GUARDS

```
//a.h
const int myInt=3;
//main.h
#include "a.h"   //define myInt here
#include "a.h"   //attempt to redefine
                 //error C2370
```

No include guards you get multiply defined symbols

Instead wrap in an include guard

```
//a.h
#ifndef MY_UNIQUEID //if not included yet
#define MY_UNIQUEID //then define this symbol
                    //and include the const def
                    //next time included,
                    //MY_UNIQUEID defined
                    //so const def not included
    const int myInt=3;
#endif
```

VC++ uses

```
//a.h
#pragma once     //only once
const int myInt=3;
```

Upshot:: ALWAYS USE INCLUDE GUARDS ON HEADERS

Header File Rules – Just declarations no definitions

declaration
In .h file

```
int a2();
```

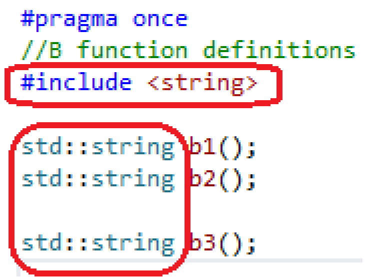
definition
In .cpp file

```
int a2(){
    return 2;
}
```

Header File Rules – minimal exposure

In .h file

Only include those files necessary to make header self contained (no compiler errors).



```
#pragma once
//B function definitions
#include <string>

std::string b1();
std::string b2();

std::string b3();
```

In .cpp file

All other includes

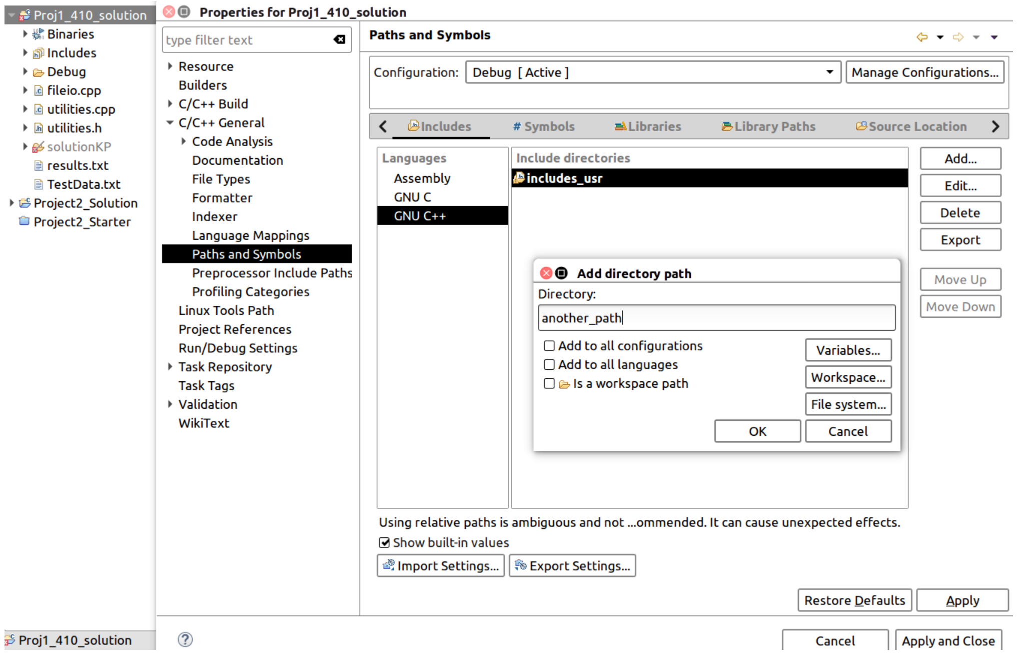
Header File General Rules

- <> for system header files
- “” for your header files
- Only const variables (unless part of a class)
- Header file should contain only related stuff
- Never include a .cpp or source file
- Never put a “using namespace …” declaration in a header file (forces anyone including your header to also use that namespace)

- General strive for complete AND minimal (only what's necessary)

Header Files – Location (eclipse)

- Big projects – Organization is key
- Source in one dir, Headers in another
  - Use relative paths (ex. #include "../includes_usr/constants.h"
  - Or let IDE find headers by specifying which directories to search



Properties for Proj1_410_solution

Paths and Symbols

Configuration: Debug [Active]

Languages: Assembly, GNU C, GNU C++

Include directories: includes_usr

Add directory path

Directory: another_path

- [ ] Add to all configurations
- [ ] Add to all languages
- [ ] Is a workspace path

Using relative paths is ambiguous and not ...ommended. It can cause unexpected effects.

- [x] Show built-in values

Exercise - Part 1

- 3_refactor_monolithic_file.cpp has a jumble of functions and constants.

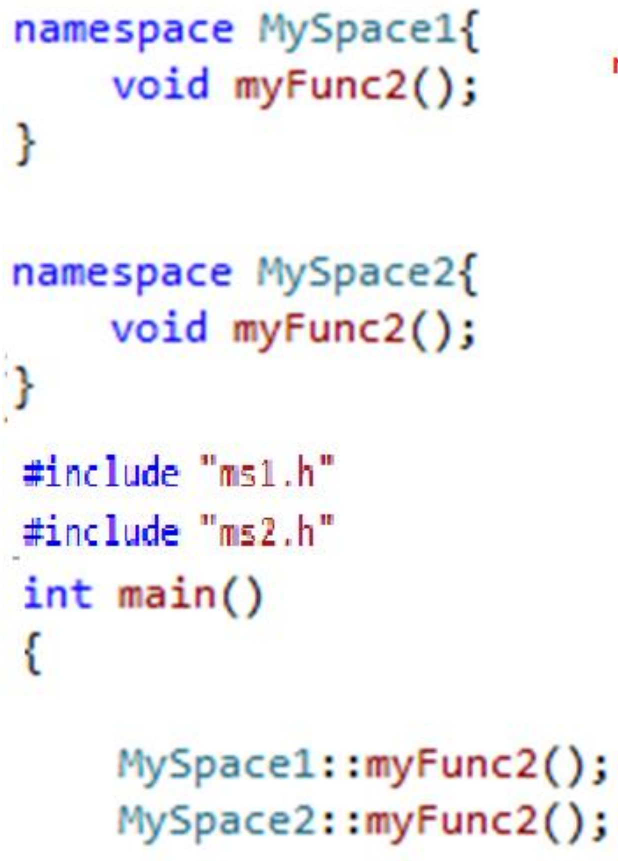
1. Refactor it into related .h and cpp files.
2. Then place all .h files in the folder ‘includes_usr’
3. Then place utilities.cpp (the function definitions) in the folder ‘utilities’

Steps 2 and 3 require relative paths

Namespaces

- Allow grouping code so there are no name conflicts. For instance..

- NOTE:must wrap both declaration (.h) and definition (.cpp) with namespace declaration!



ms1.h

```
namespace MySpace1{
        void myFunc2();
}
```

ms2.h

```
namespace MySpace2{
        void myFunc2();
}
```

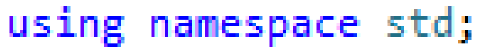
main.cpp

```
#include "ms1.h"
#include "ms2.h"
int main()
{

        MySpace1::myFunc2();
        MySpace2::myFunc2();
```

Namespaces

- Use ‘using’ construct – tells compiler to look in a particular namespace.



```
using namespace std;
```

- Allows cout instead of std::cout
- There are many namespaces. Wrap your code in namespaces if there is a chance that your functions have the same name as others (encrypt, decrypt, open, close etc…)

Exercise - Part 2

- 3_refactor_monolithic_file.cpp project

1. Refactor to use namespaces (both constants.h and utilities.cpp and .h)