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# The Programming Environment

Nowadays, most code is developed inside what is known as an IDE—an *Integrated Development Environment*. An IDE integrates all the tools you need to prepare, debug, test and run a program.

#### Recall the process introduced earlier



Preparation of a program requires the following basic steps:

- 1. Edit your module to produce a source file
- 2. Compile your module to produce an object file
- 3. *Link* the object file with other *object modules* to produce an *executable file* (a program).
- 4. Run the executable (your program).

All of these steps can be done from within the IDE.

For convenience, steps 2 and 3 may be combined in which case they are referred to as a *build*.

Once a program has been built, it is a standalone program.

It may be executed independently from the IDE

### Debugger

In addition to basic editing and build tools, IDEs will generally provide a *debugger* which will allow you to run your code interactively.

# Setting up a Project

You might want to bookmark this page.

You need to understand not only what it is you are to do (what buttons to push) but what it is that your doing (the structure and function of the files and directories being created).

**Step 1:** Create a directory for the course (if you are in the lab do it on your M drive). Call it programming or 2420 or any other convenient name.

Step 2: Create a directory for your assignments, something like assigns.

**Step 3:** Now start up the Visual C++ program. (How you do this will vary with your computer setup. On most machines, go to the start menu, select programs, then Microsoft Visual C++ 6.0 which will give you another menu. Select Microsoft Visual C++ from that one as well.) Here is how it looks in Windows XP

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**Step 4:** Once the Visual C++ envuronment is open (and you've closed any hints boxes) choose File menu then pick New. You should see the following dialog box:

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New Files Projects Workspaces Other Documents ATL COM AppWizard Cluster Resource Type Wizard Custom AppWizard Database Project DevStudio Add-in Wizard ISAPI Extension Wizard Makefile MFC ActiveX ControlWizard MFC ActiveX ControlWizard MFC ActiveX ControlWizard	Project name: Assign0 Logation: C:\DOCUMENTS AND SETTIN C:\Cocument workspace C Add to current workspace C Add to current workspace
<ul> <li>MFC AppWizard (exe)</li> <li>Utility Project</li> <li>Win32 Application</li> <li>Win32 Console Application</li> <li>Win32 Dynamic-Link Library</li> <li>Win32 Static Library</li> </ul>	Platforms:

Here you need to do three things:

- 1. Choose the Win32 Console Application as shown.
- 2. Pick the ... box to the right of the Location: box and navigate to your Assigns directory.
- 3. Then type the name, Assign0, into the project box for you practice assignment.

Once all your choices have been made, hit OK.

At this point what you have done is created a Project Workspace, a place where all your project files will be kept.

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This includes special files required to manage the project. Let's use Windows Explorer to see what the IDE has done.

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Here, in the Folders view on the left, we can see the Assigns directory was created underneath the Structured Programming directory by the programmer.

Then *the IDE created* the Assign0 directory under that and populated it with all the files we see in the right pane.

The Assign0.dsp, the Assign0.dsw and the Assign0.ncb files are all project management files that the IDE creates.

It also created the Debug directory (which so far is empty).

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**Step 5:** Once again choose File menu then pick New. The dialog box should look a little different this time:

New	? 🔀
Files       Projects       Workspaces       Other Documents         Active Server Page       Binary File         Binary File       C/C++ Header File         C/C++ Header File       C+- Source File         Cursor File       HTML Page         Icon File       Macro File         Presource Template       SQL Script File         SQL Script File       Text File	✓ Add to project:         Assign0         ✓         File name:         Assign0         Logation:         C:\DOCUMENTS AND SETTIN
	OK Cancel

It's actually the same dialog box but the Files tab should have been automatically selected this time. The IDE knows you've already created a project so it assumes you want to create one of the modules (files) for the project.

You can over-ride the choice by selecting another tab. But this is the one we want now.

- 1. Choose C++ Source File
- 2. Make sure Add to project box is checked
- 3. Assign0 should already appear in the Project box
- 4. Type the name of the file in the File Name box. We'll use Assign0 again. (Projects usually contain many C++ files but the one with main() in it is usually named after the project.)

Hit OK.

The IDE will create an empty file for you.

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**Step 6:** Type in your program module. In this image, we've created a very basic Hello world program.

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Workspace 'Assign0': 1 project	<pre>Assign0.cpp * #include <iostream> using namespace std; int main() {     cout &lt;&lt; "Hello world!" &lt;&lt; endl;     return 0; }</iostream></pre>				

In the left hand pane we have selected the Files tab which will be more usefule to you this term than the classes tab.

It shows that there is a single source file in the Assign0 project files, called Assign0.cpp.

The right window shows the simple code typed into the actual file. The \* in the titlebar after the Assign0.cpp is telling you that the file has changed since it was saved last. When we save the file it will clear.

Step 7: Use the Build menu to compile, link, build (do both together) or run our file.

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Header Files     Execute Assign0.exe Ctrl+E5	$\langle \langle endl \rangle$						

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Here we have highlighted execute <code>Assign0.exe</code>. When we select this, we get a dialog that informs us we haven't built the project yet and asking us if we want to do so. Select OK or yes and the following will happen:

- 1. The file will be saved
- 2. It will be compiled.
- 3. If there are no grammar errors the resultant Assign0.obj file will be linked with the isstream library.
- 4. If there are no linker errors, the resultant Assign0.exe file will be executed.

The file is executed inside a windows command console, a small, plain window that emulates an old fashioned DOS screen

"C:\DOCUMENTS AND SETTINGS\MPBL.ENGRNT\MY DOCUMENT
Hello world! Press any key to continue_

Once your program has finished, you will see a line saying Press any key to continue. Since our program only outputs one line and then ends, we see the Hello world! line first.

Hitting any key will close the console window.

**Cleaning Up After** 

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When you're done developing your program you will find the project directory file has grown

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<ul> <li>Assign0</li> <li>Debug</li> <li>Teaching Portfolio</li> <li>Term6 Design</li> <li>My Computer</li> <li>My Network Places</li> <li>Recycle Bin</li> <li>Tutorials</li> <li>Unused Desktop Shortcuts</li> </ul>	⊒	Ш

Not only has our Assign0.cpp file been added, so has the Assign0.plg file. No, we don't know what it is exactly either. Yet another maintenance file added by Microsoft.

It gets worse. Check our formerly empty Debug directory

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and you'll find a whole bunch more files, one of which is almost 2MB in size!

The one you care about is Assign0.exe. This file can be copied, sent to your Mom, sold to the highest bidder. It is your stand-alone executable file. Doubleclick on it and it will run (inside a command console again).

Step 9: When you are done with an assignment, all files *except your source file(s)* should be erased. They take up a lot of space on your M drive. Don't worry. If you need them they are easy to re-create.

Make sure you close the Visual C++ IDE first or it may not let you erase some files.

When you're done, this is all you should have:

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### Interactive and Batch Mode

#### Interactive Mode

A (human) user will enter the data in response to prompts while the program executes.

#### Batch Mode

Runs without direct human interaction. Data is read from a file, and output is written to a file.

Note: The assignment testing is done in batch mode.

#### Input/Output Redirection

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On Unix, Cygwin, or in a command window:

myprog < mydata.txt —run myprog using mydata.txt for the standard input (cin).

myprog > myoutput.txt—run myprog using myoutput.txt for the standard output (cout).

myprog < mydata.txt > myoutput.txt —run myprog using mydata.txt for the standard input, and myoutput.txt for the standard output.

#### **Programming Errors**

#### Syntax Errors

- The program code contains something that isn't a valid C++ statement.
  - Detected by the compiler.
- Fix the first one first—a simple typo can result in many error messages.

#### **Run-time errors**

The program attempts to perform an illegal operation (e.g., divide by zero). Undetected errors

The program runs but doesn't give the right results. Be very careful to check that the results are what you expect.

#### Logic errors

The algorithm is incorrect. Desk check (walk through) your program.

## **Recreating a Project**

If you need to recreate your project later on, first make sure you have your (in our example Assign0.cpp) file and it is still in the Assign0 directory. Then follow **Steps 3 & 4** above except that in Dialog Box for creating a new project (**Step 4**) select the directory which contains your project directory as the location (in this example the Assigns directory) then enter the name of your existing assignment directory as the project name (e.g. Assign0).

Instead of **Step 5** (creating a new file) click on the File menu, select Open, and open your existing file. Then right click on your opened file and select Add to Project and voila! you're back in business.

This page last updated on Thursday, January 8, 2004