Creating Projects using Microsoft Visual Studio 2022

CTEC1332

Software Engineering Practices

2023 Fall

Version **2.1**: Covers Windows 10 PCs in L117
Last updated: **2023.09.02**

Niagara College Canada
APPLIED DREAMS.
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Visual Studio 2022 Guide

PART 1: BASIC OPERATION

Starting Visual Studio 2022

- Both Visual Studio 2022 and Visual Studio 2019 are installed on PCs in **L117**.
- (There is a separate guide for Visual Studio 2019.)
- Otherwise, you can download and install the latest version on your PC (or Mac)…

Starting Visual Studio 2022

Download and install **Visual Studio 2022 Community** edition:

https://visualstudio.microsoft.com/downloads/

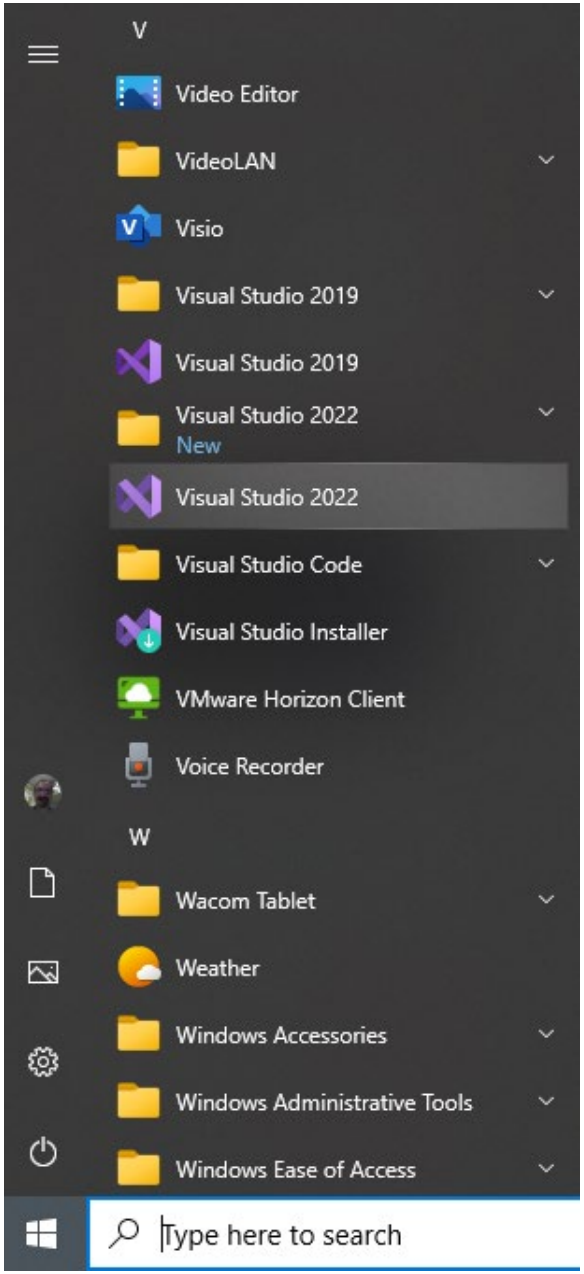
This is the preferred option, because it installs Visual Studio on **your PC** (or Mac).

Starting Visual Studio 2022

- The following slides refer to using a **native installation** of Visual Studio on a Windows 10 PC.

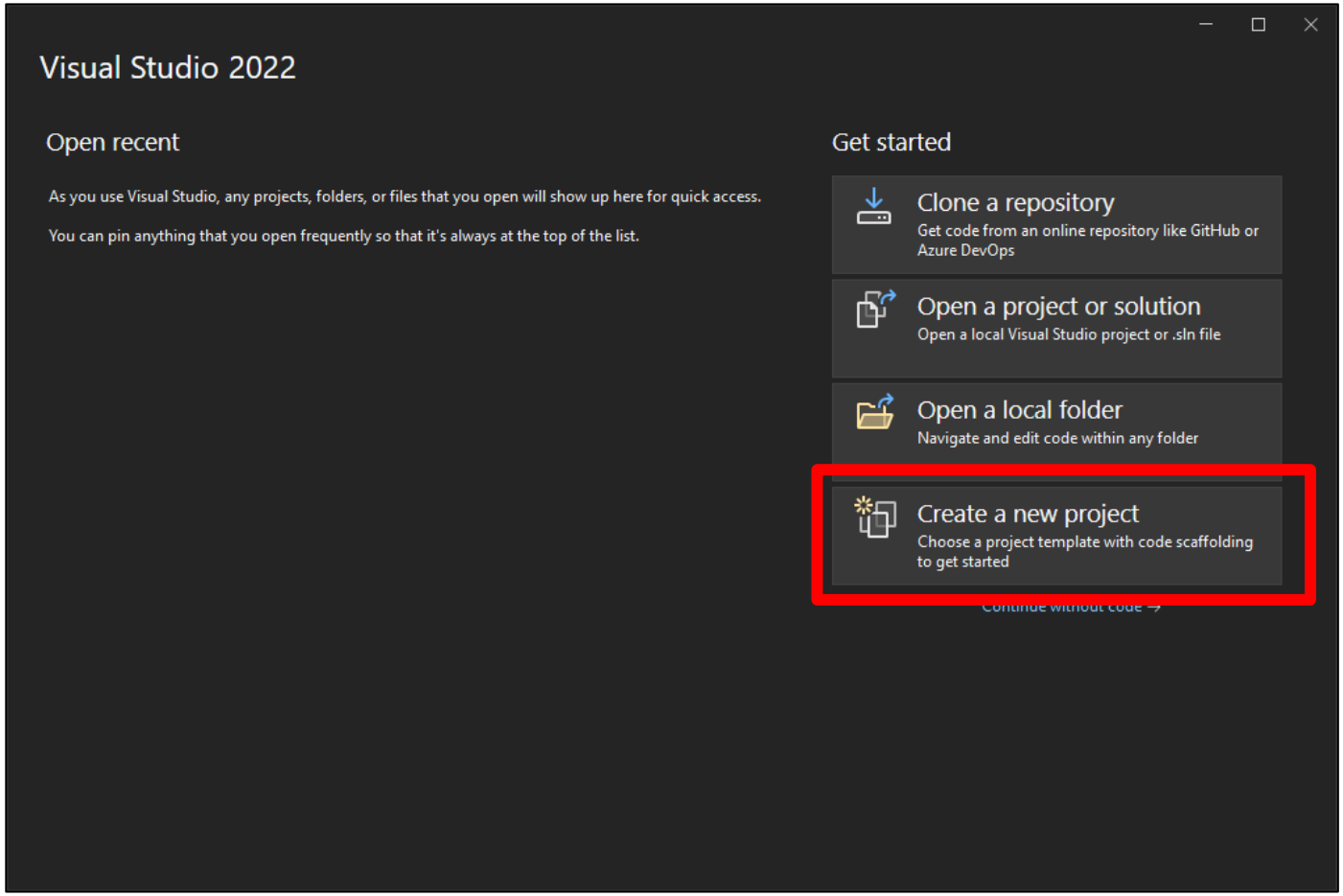
Starting Visual Studio 2022

- From the Windows 10 Start Menu go to the "V" section and start Visual Studio 2022 (it has a purple icon).



The “splash screen” is shown while Visual Studio loads … it may take several seconds.

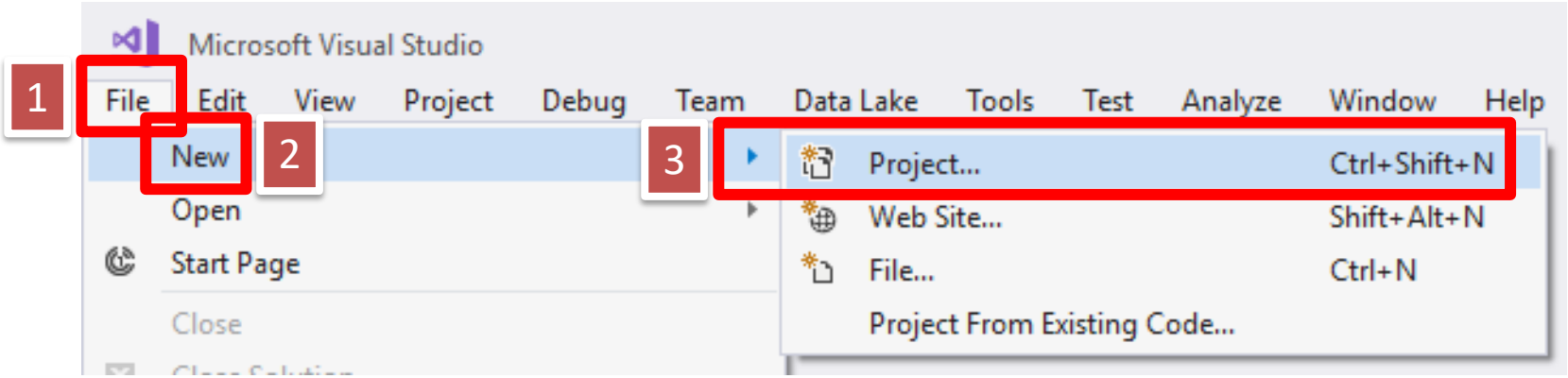
Visual Studio 2022



This is the “Dark” colour theme (the default.) It can be changed…

Create A New Project (Alternate Ways)

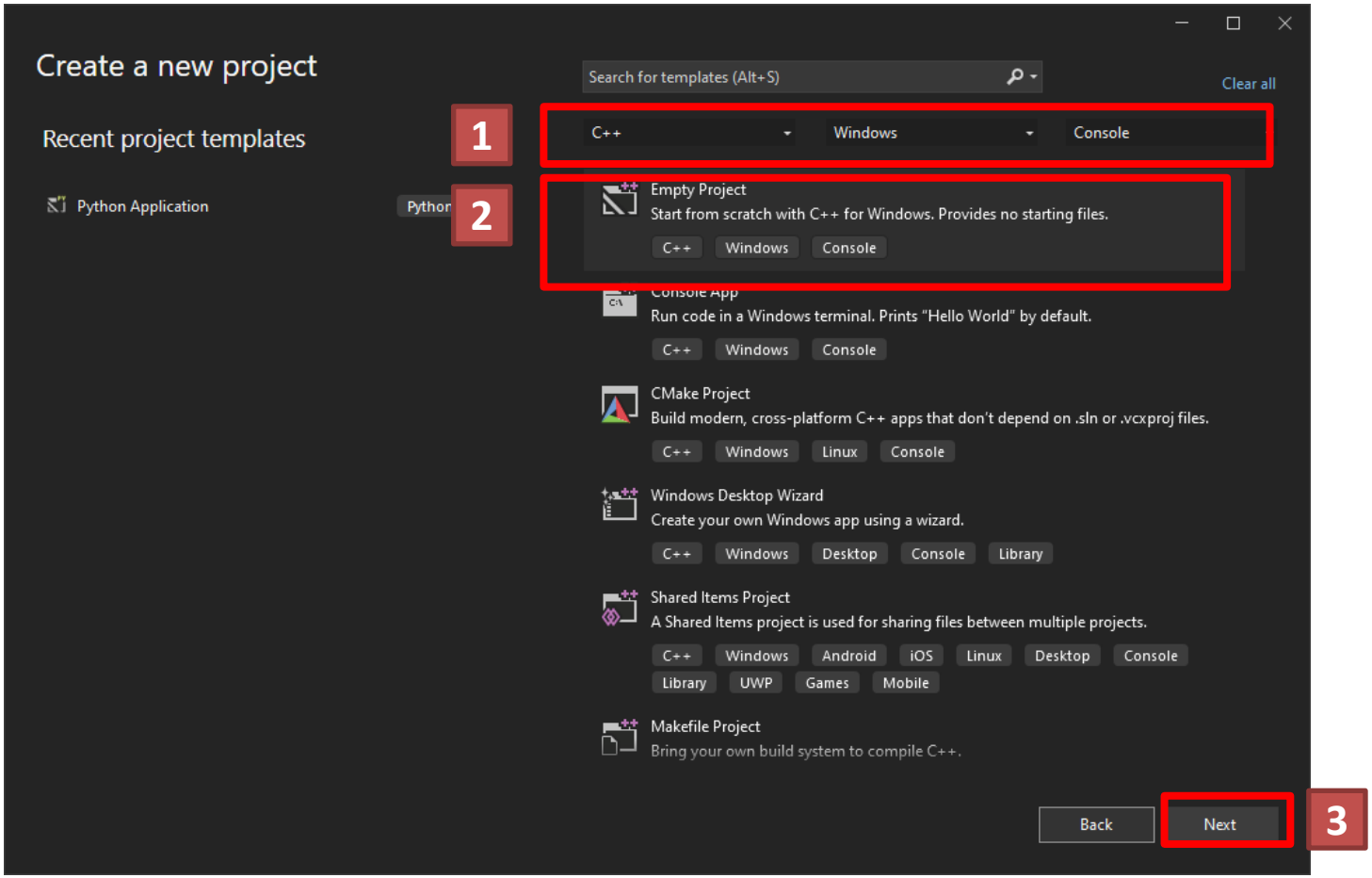
- From the **File** menu, select **New**, then **Project…**
- You can also press **Ctrl+Shift+N** instead



This is the “Blue” colour theme on Mike Boldin's PC.

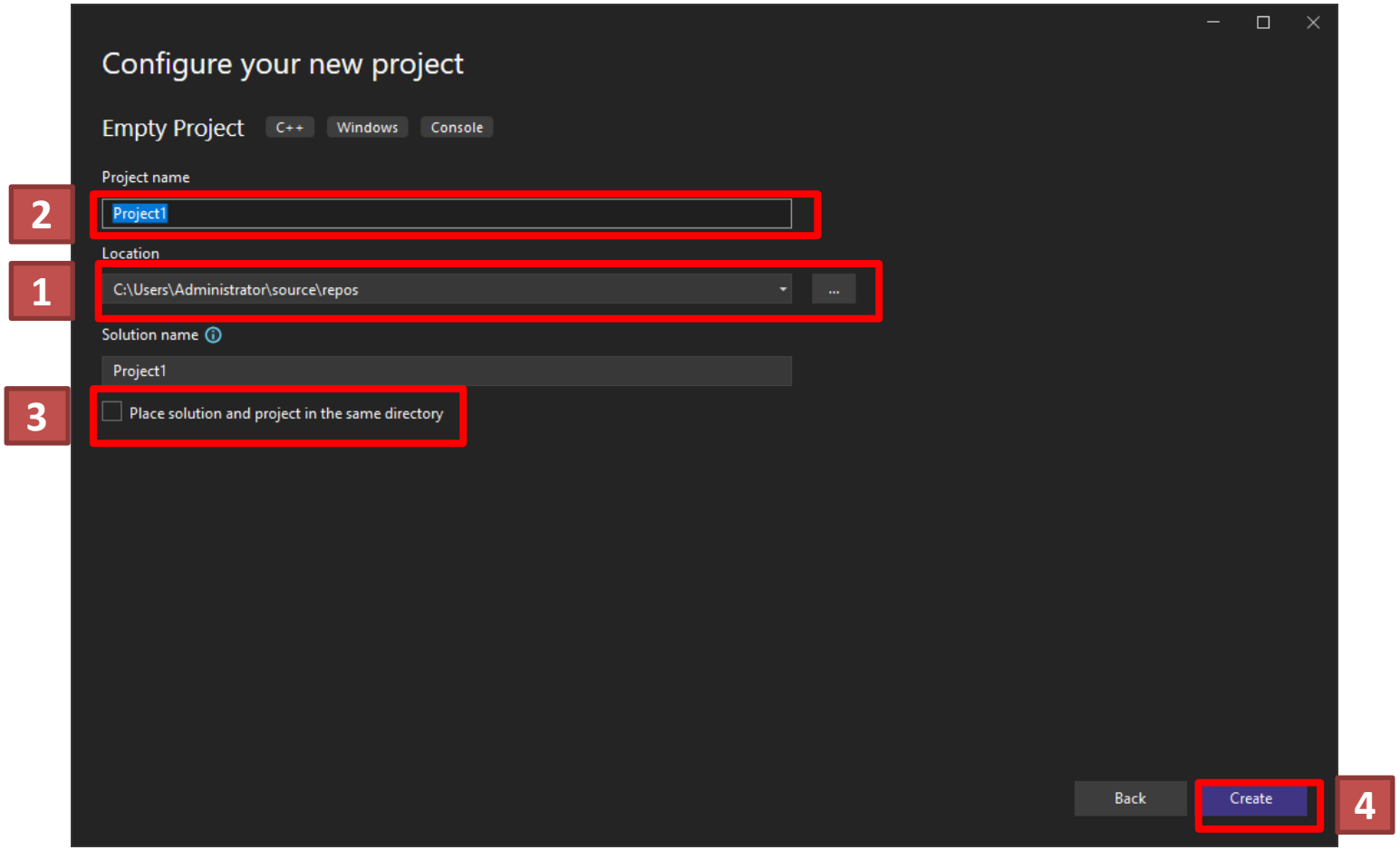
The “Create a new project” dialog box appears

For every program we do in this course, the Language is **C++**, the platform is **Windows**, the project type is **Console**, and the project template is **Empty**

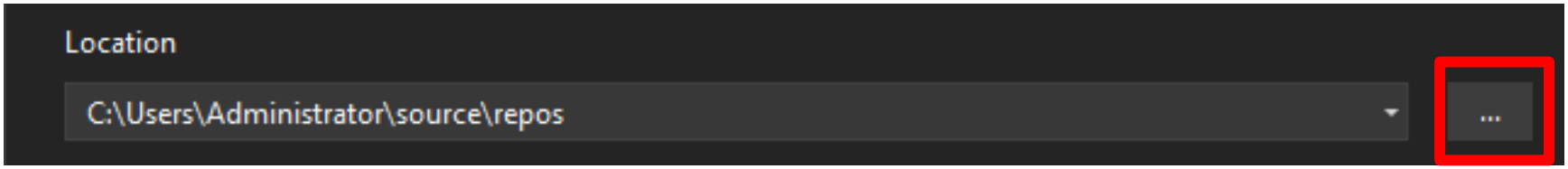


The “Configure your new project” dialog box appears

Every program we do in this course will have **its own folder**. **You are responsible** for keeping track of your files!

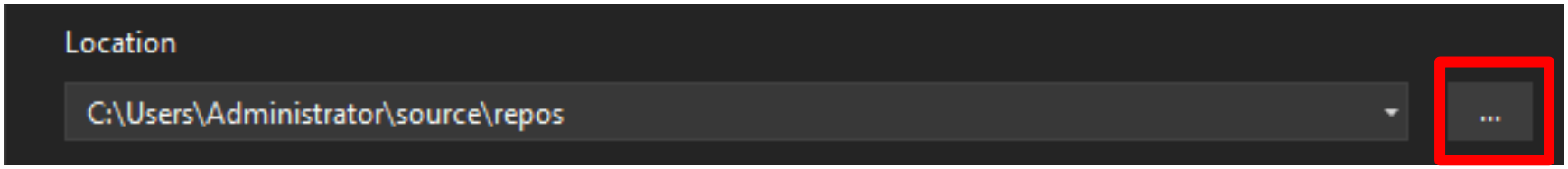


Step 1. Choose the Project Location



- Click on the “browse” button to pop up the “Project Location” dialog box. From here, choose or create a folder in which to store your project**s**.
- **Each project will have its own subfolder**.
- If you choose to save projects on drive **C:**, it may be faster, **BUT** you need to back up those folders!

Step 1. Choose the Project Location



- **I recommend the following** (in order of preference)**:**

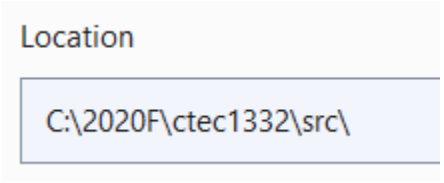
1. The "Storage" partition on the internal NVMe SSD (fastest option, but you need to **manage** your files);
2. Your own USB SSD or HD (fast and private);
3. Your “One Drive – NC” – if available (automatically copied to the Cloud);
4. Your own USB flash drive (slowest option).

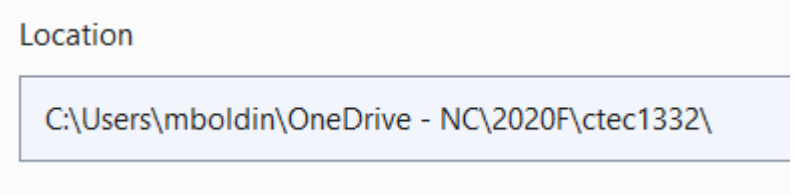
Step 1. Choose the Project Location

- If you are working in L117, choose the "Storage" partition on the internal SSD (solid state disk) – **E: drive**.

- When you are finished, **make sure** that you:
  1. **Copy your files** to your own USB and/or your One Drive NC, so that you have a copy;
  2. **Delete your files** from the SSD, so that others cannot copy your work!

Step 1. Project Location Examples

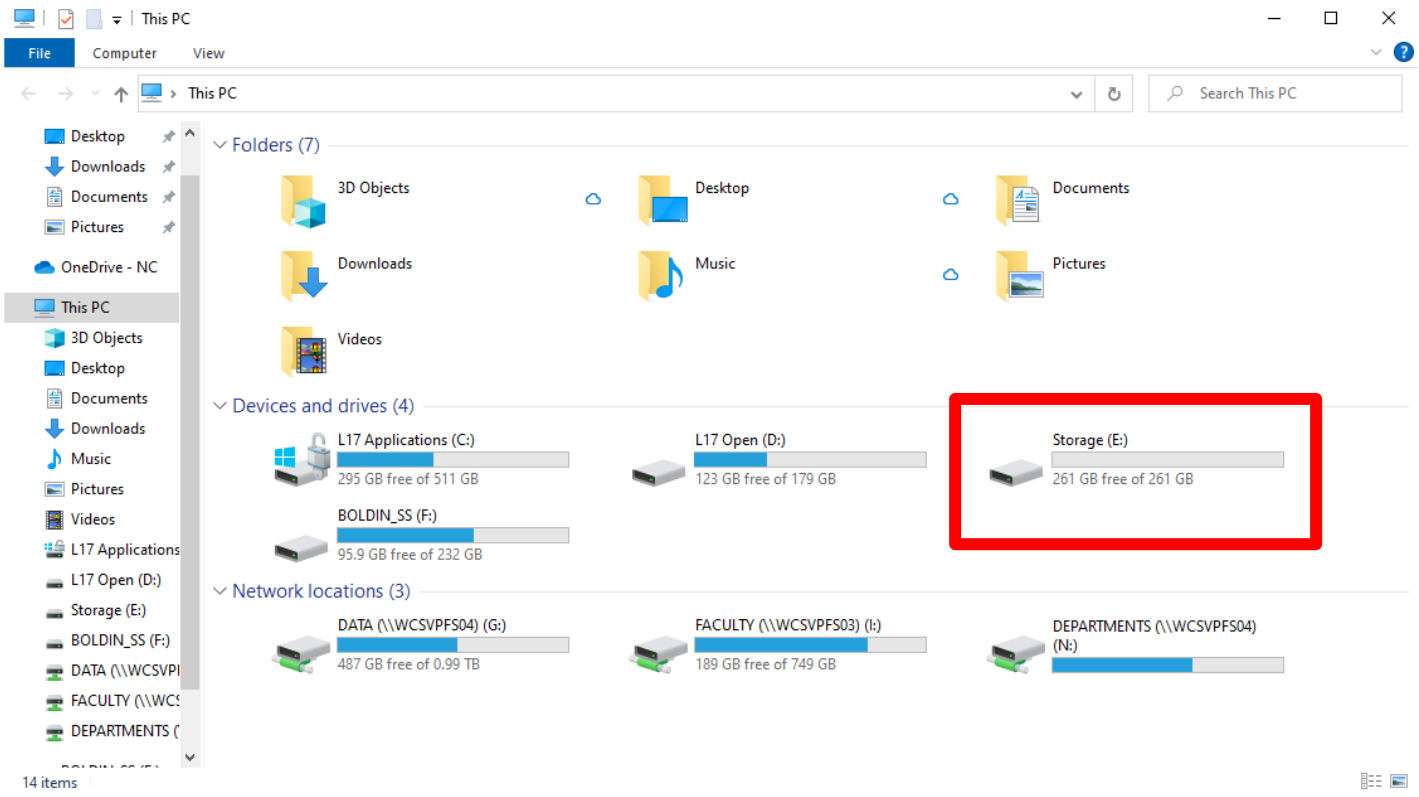




- In the example on the left, I have chosen **`C:\2020F\ctec1332\src`** as the main folder for all my Visual Studio projects.

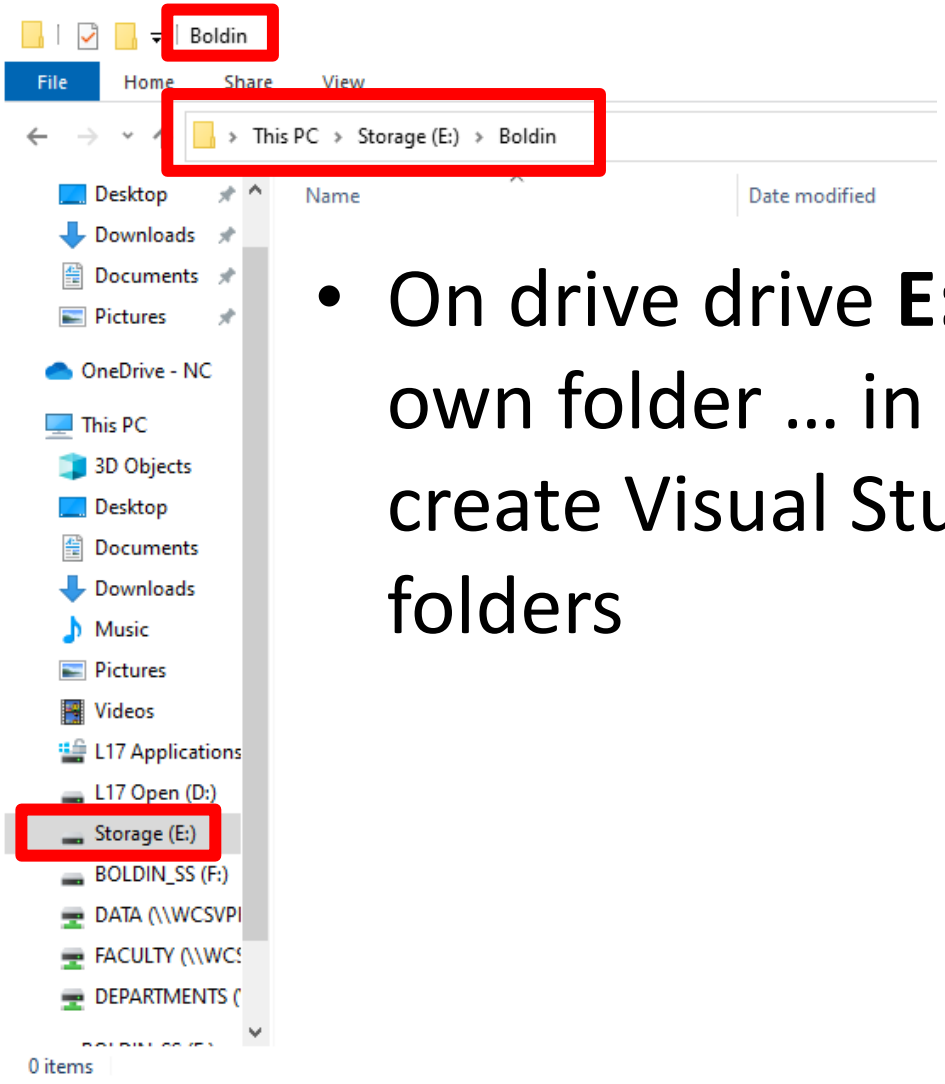
- In the example on the right, I have chosen my **OneDrive**, and created a "`2020F`" folder, then a "`ctec1332`" subfolder, which will be the main folder for projects.

Step 1. Suggested Project Location in L17



- In this example, using Windows Explorer/File Explorer, I have chosen drive **E:** …

Step 1. Suggested Project Location in L17

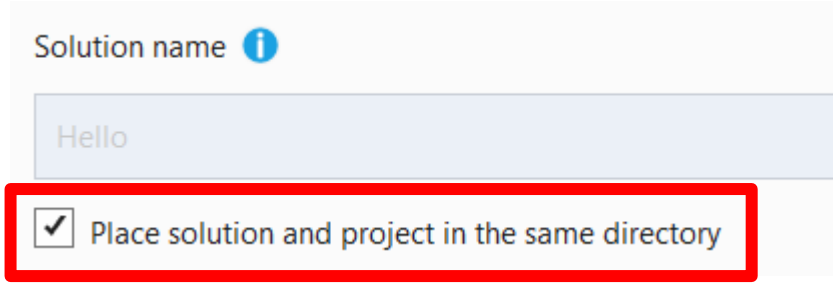


- On drive drive **E:**, I create my own folder … in this folder, I will create Visual Studio project sub-folders

Step 2. Give the Project a Name

- The name will be used for both the project folder and the executable.
  - For example, for the C++ Console app above, if I **don't** change the name, the project folder will be `Project1` and the executable will be written to `Project1\x64\Debug\Project1.exe`

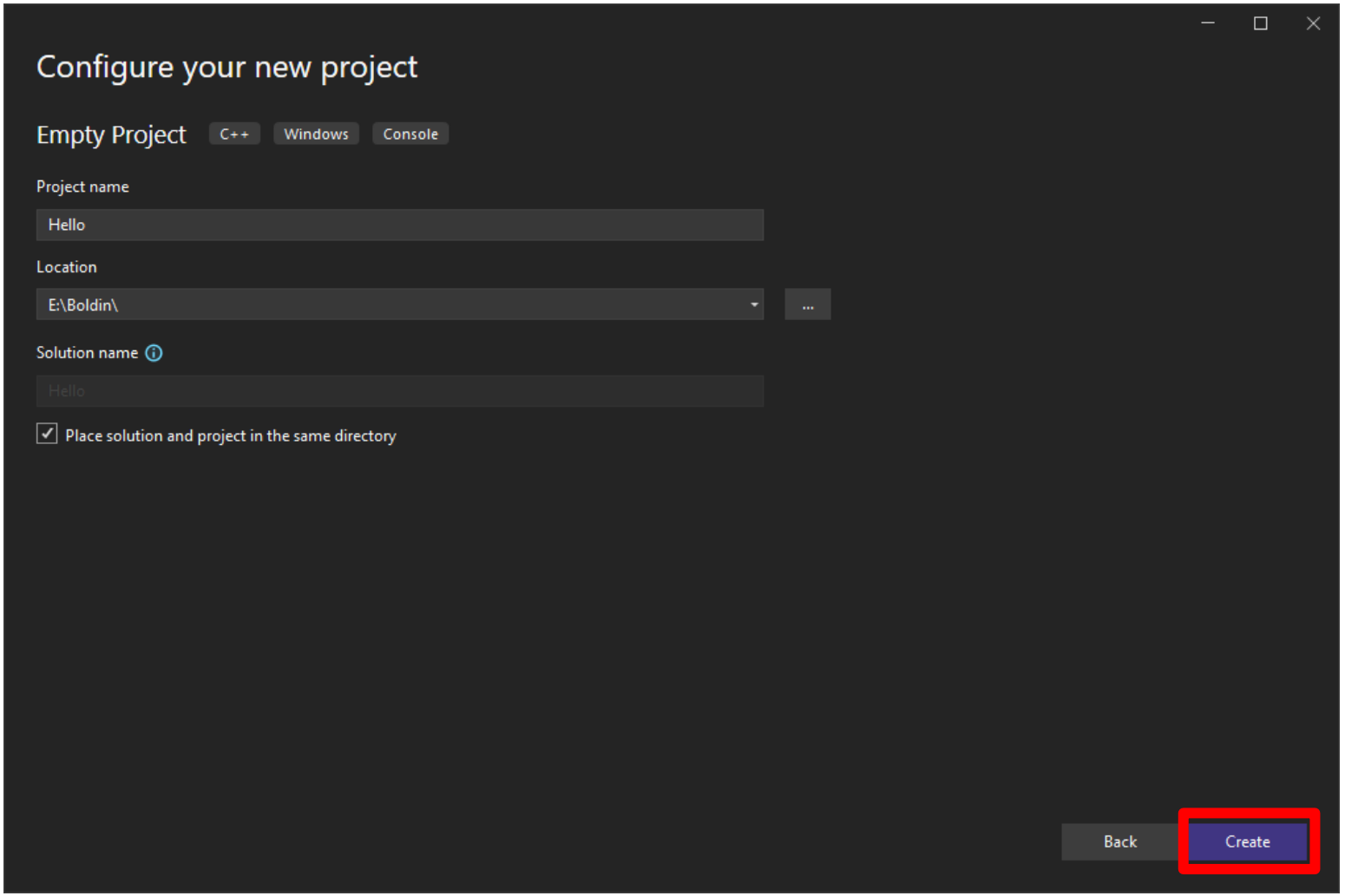
Step 3. One Directory Only



- Visual Studio allows you to create **multiple** Projects within a single Solution.

- In this course, we will have **exactly one** Project per Solution, so to simplify things, only one folder is needed.

Step 4. Create the Project



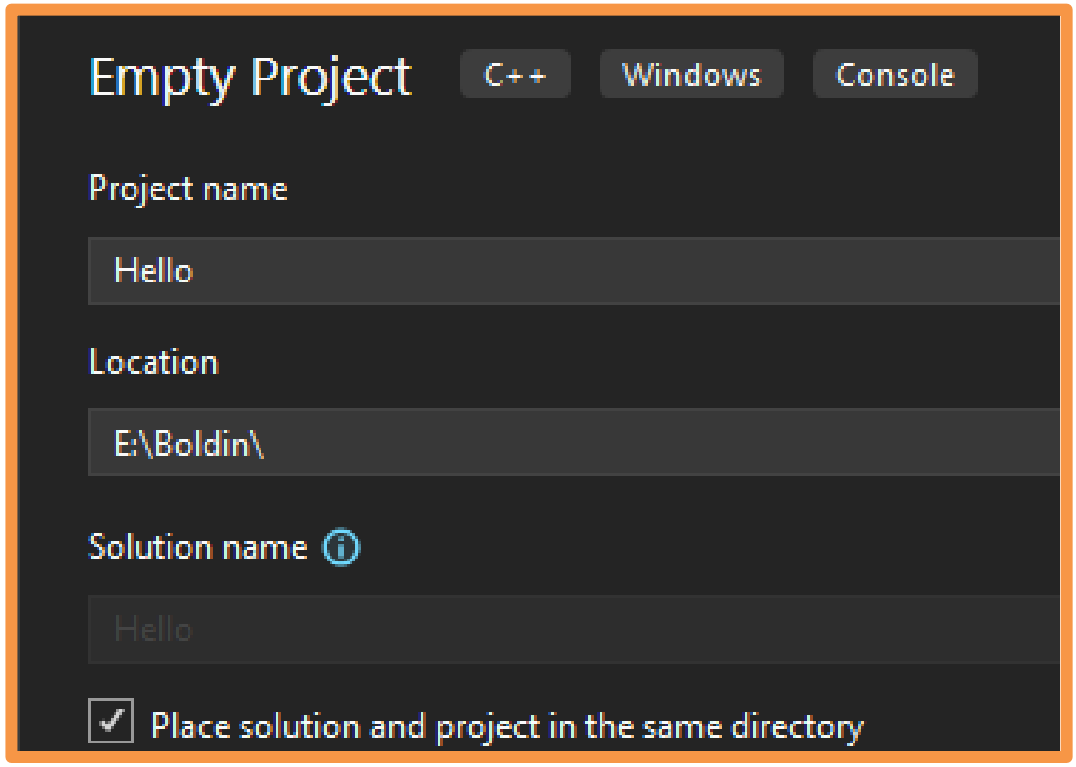
Step 4. Project Example Details…

Project folder location will be **`E:\Boldin\Hello`**

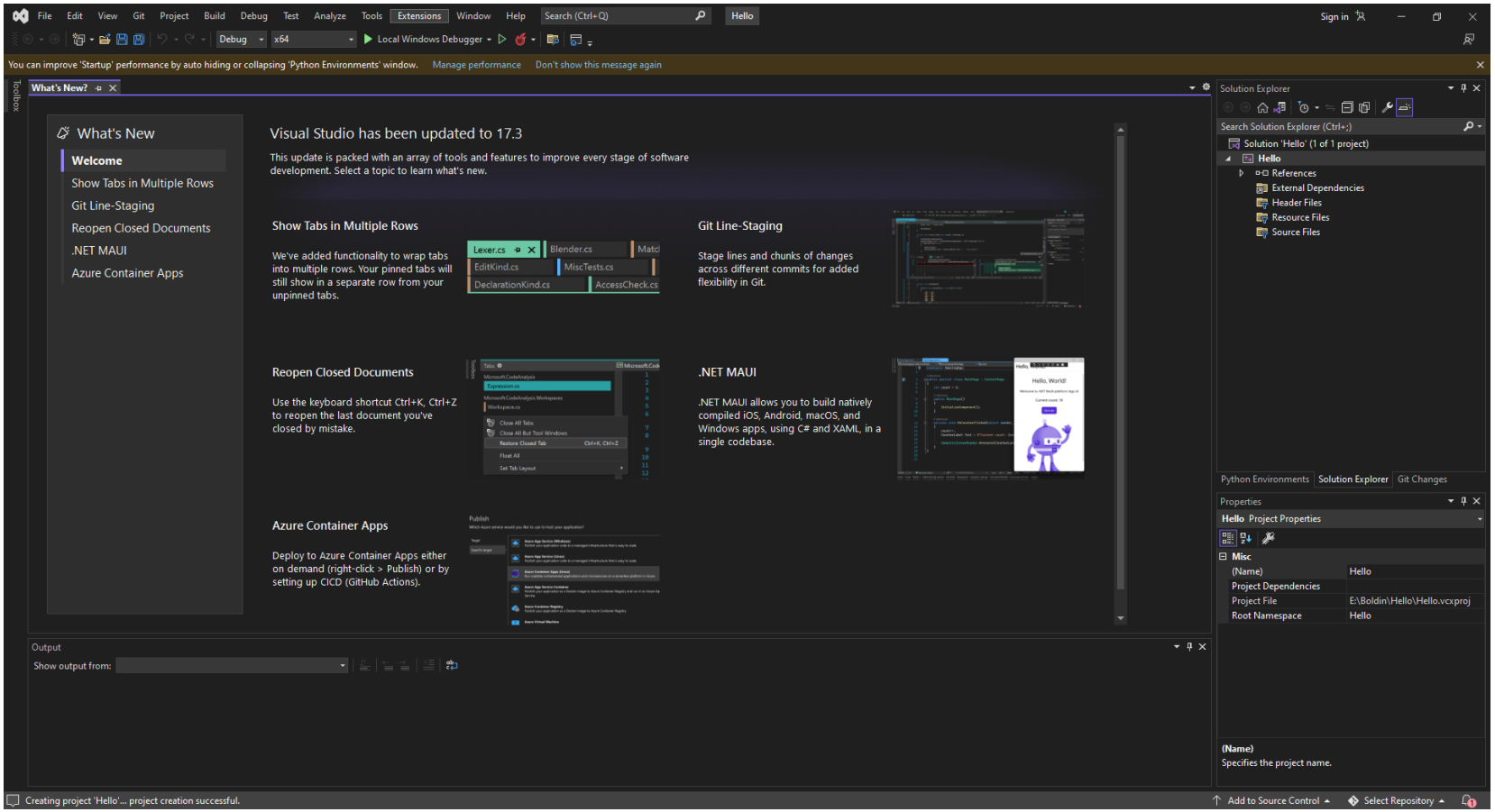
Executable will be called **`Hello.exe`**

I will add at least one **`.c`** file in this folder

(C is a subset of C++)

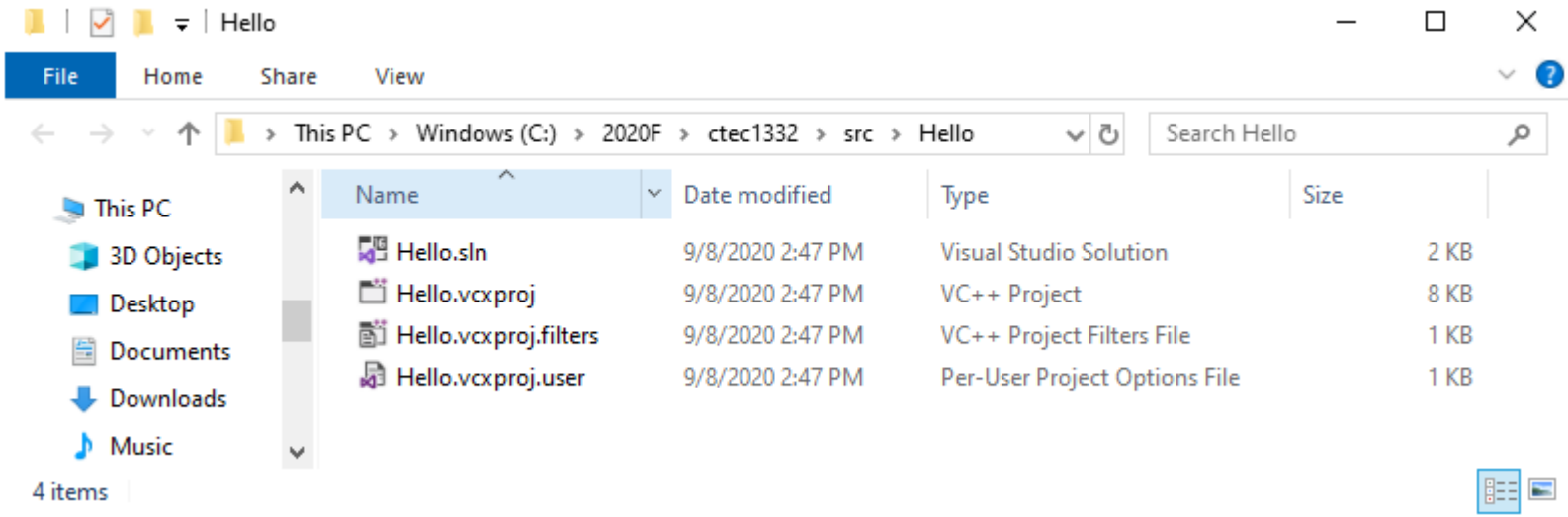


New Project Created



Visual Studio creates an “Empty” project, meaning that you have to **add** a **source code** file. (Note: you can close the "What's New?" pane.)

Empty Project Folder Example



There are four files and one hidden directory.

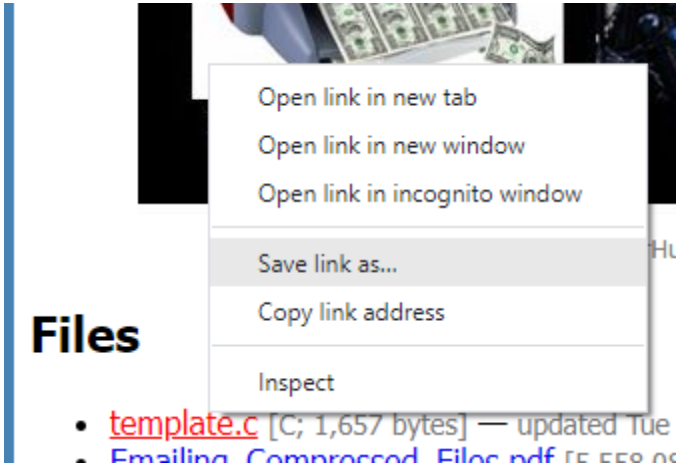
Copy a source code (`.c`) file here, using either File Explorer or the Command Prompt.

A template `.c` file is always here:
http://technology.niagaracollege.ca/courses/ctec1332/template.c

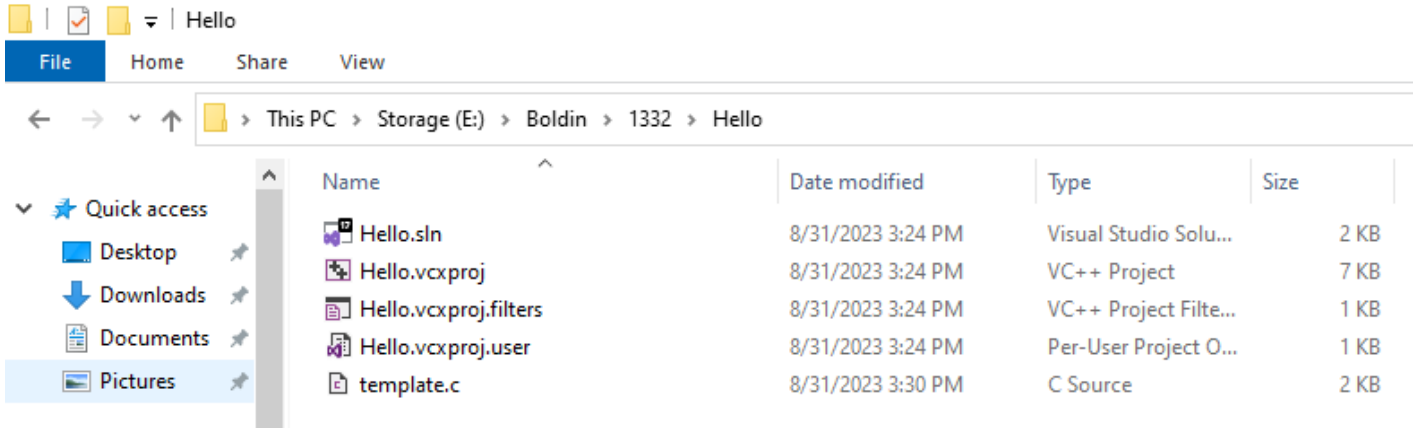
Downloading the Template

A template `.c` file is always here:
http://technology.niagaracollege.ca/courses/ctec1332/template.c

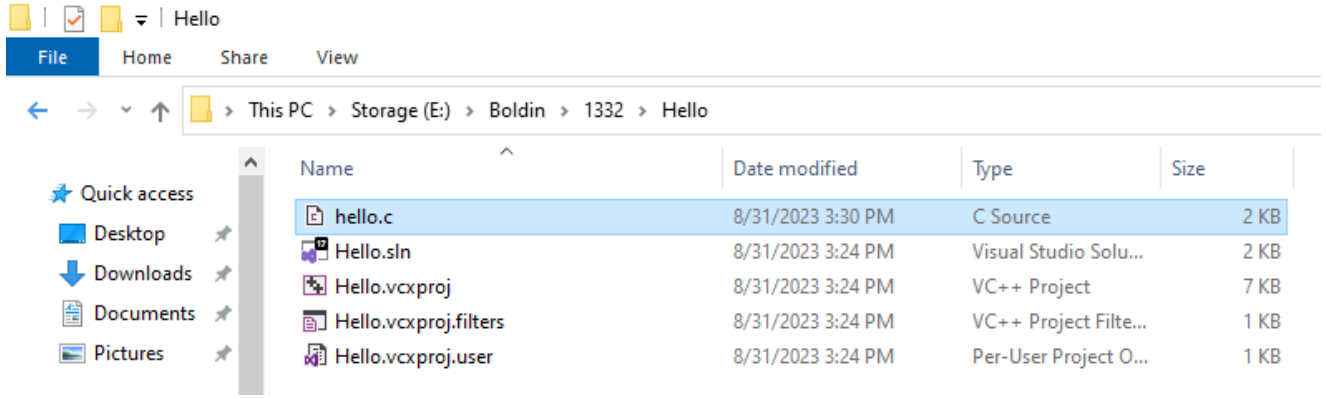
To download, right click and choose "Save link as…". You can then download and save the `template.c` file directly into your project folder (and even rename it at the same time.)



Empty Project Folder Example



Here I downloaded template.c to my project folder. I can right click and Rename it after the fact:



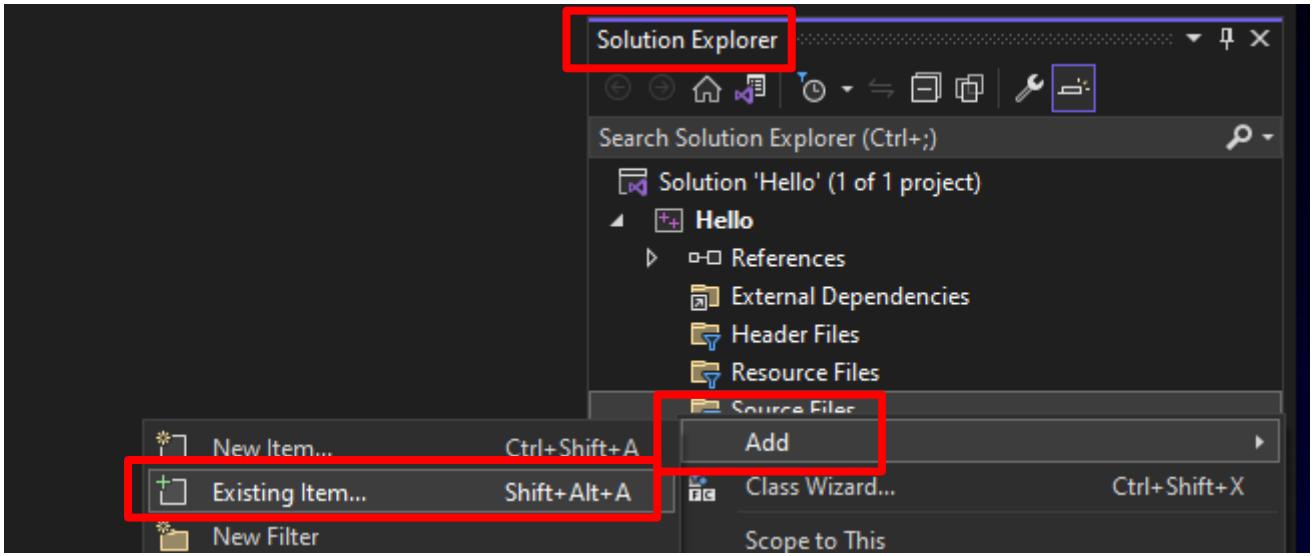
Adding an **existing** C file

In this course, we ALWAYS want to start with an EXISTING C file!

Right click on the "Source Files" category in the Solution Explorer.

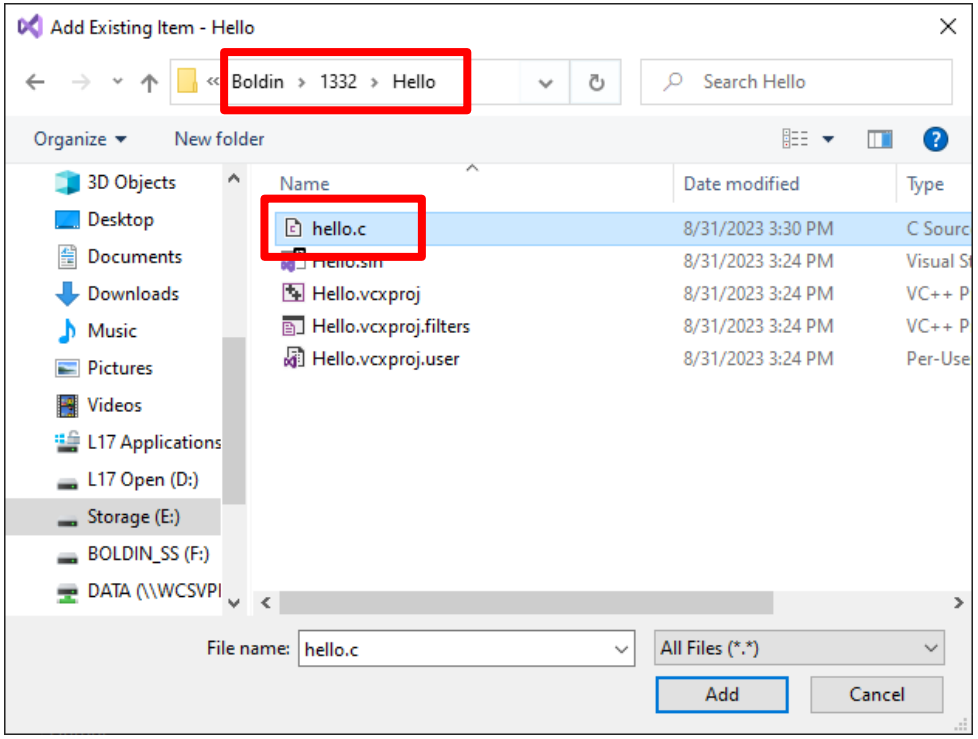
Select "Add Existing Item…".

Alternately, press the `[Shift]+[Alt]+[A]` key combination.



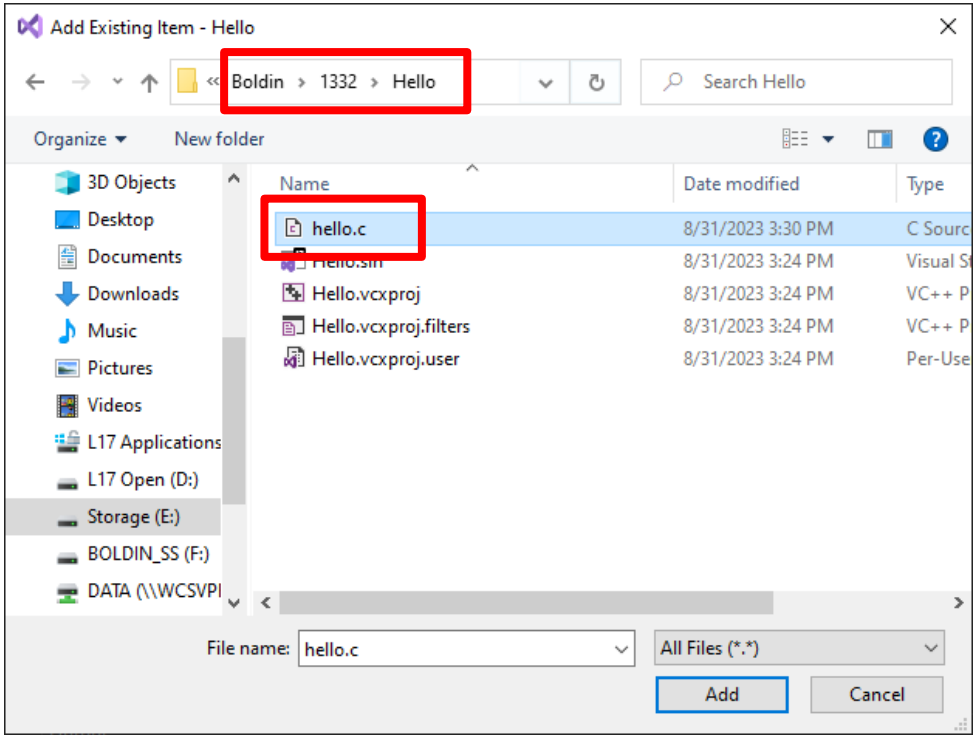
Adding an existing C file

Make sure that you browse to the correct project folder -- the one that you are working on! This way, you add the correct C file to the project.

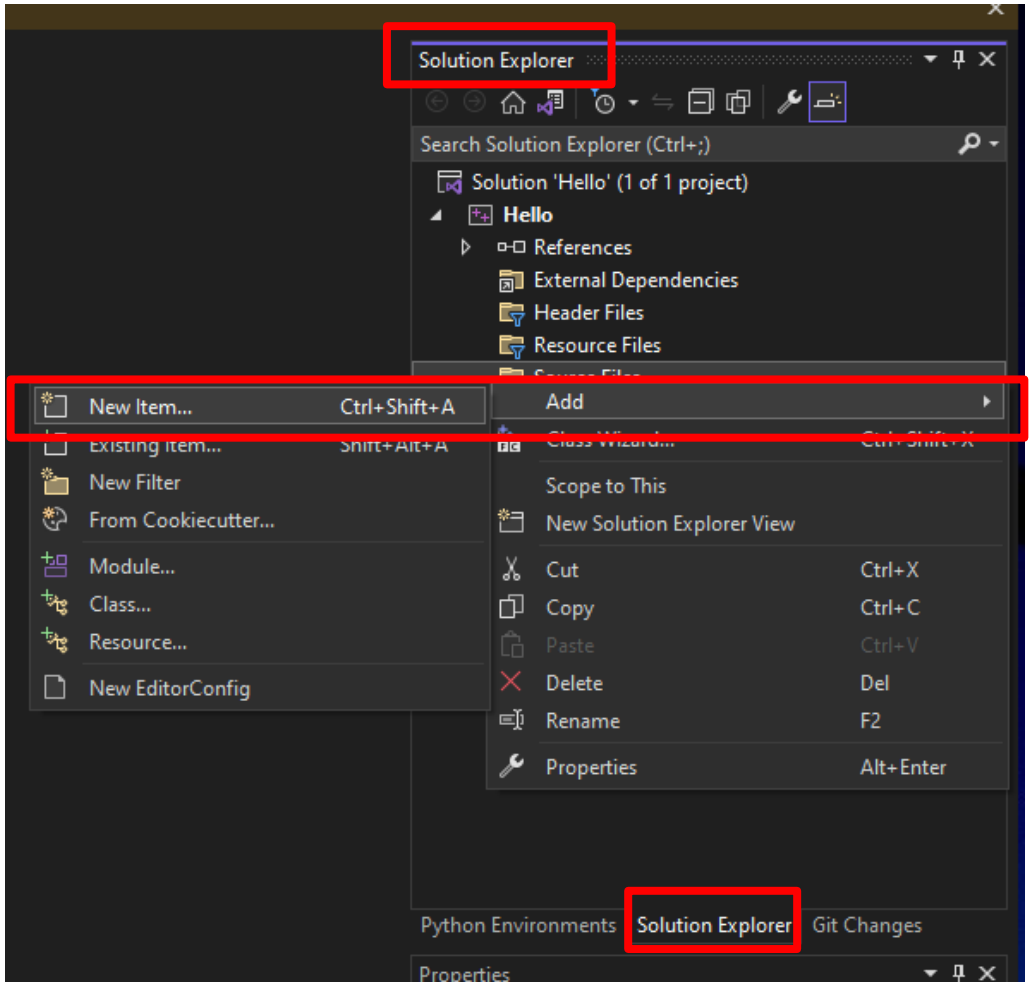


Adding an existing C file

Make sure that you browse to the correct project folder -- the one that you are working on! This way, you add the correct C file to the project.



[Optional] Adding a new C file



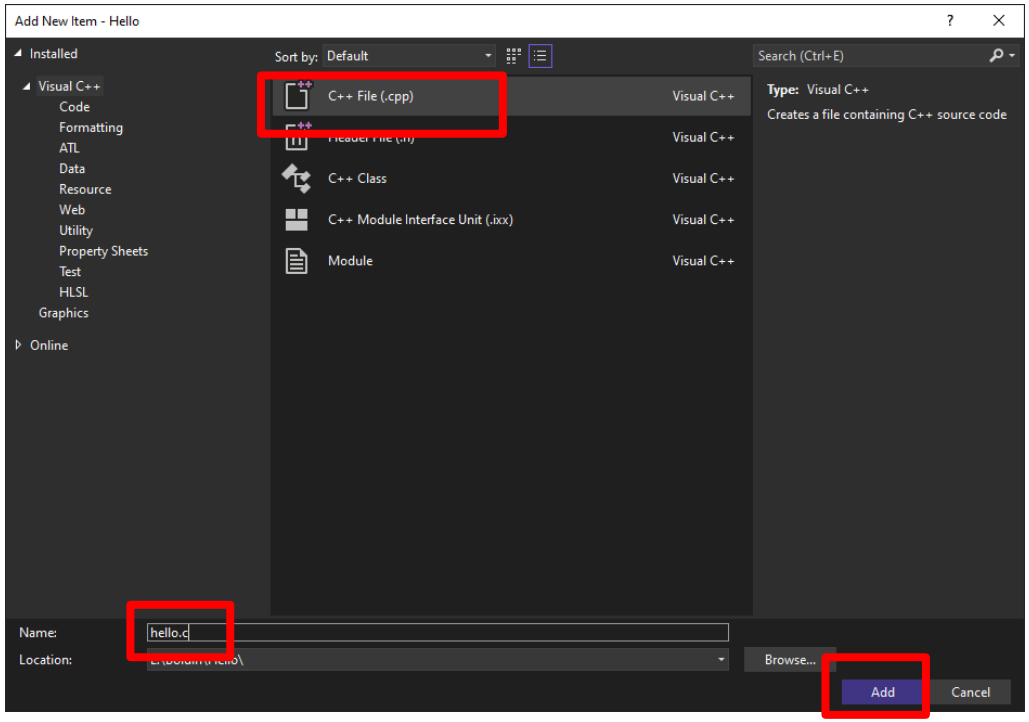
Another way is to **Add** a **New Source File** to the project.

Right click on the "Source Files" category in the Solution Explorer.

Note: We will **not** normally do this, because it requires you to type in C code from scratch!

[Optional] Adding a new C file

1. Choose a **C++ File** (**.cpp** extension is the default)



2. Erase the "**pp**", leaving only **.c** as the extension. (The file will be automatically saved in the project folder.)

One way is to **Add** a **New Source File** to the project.

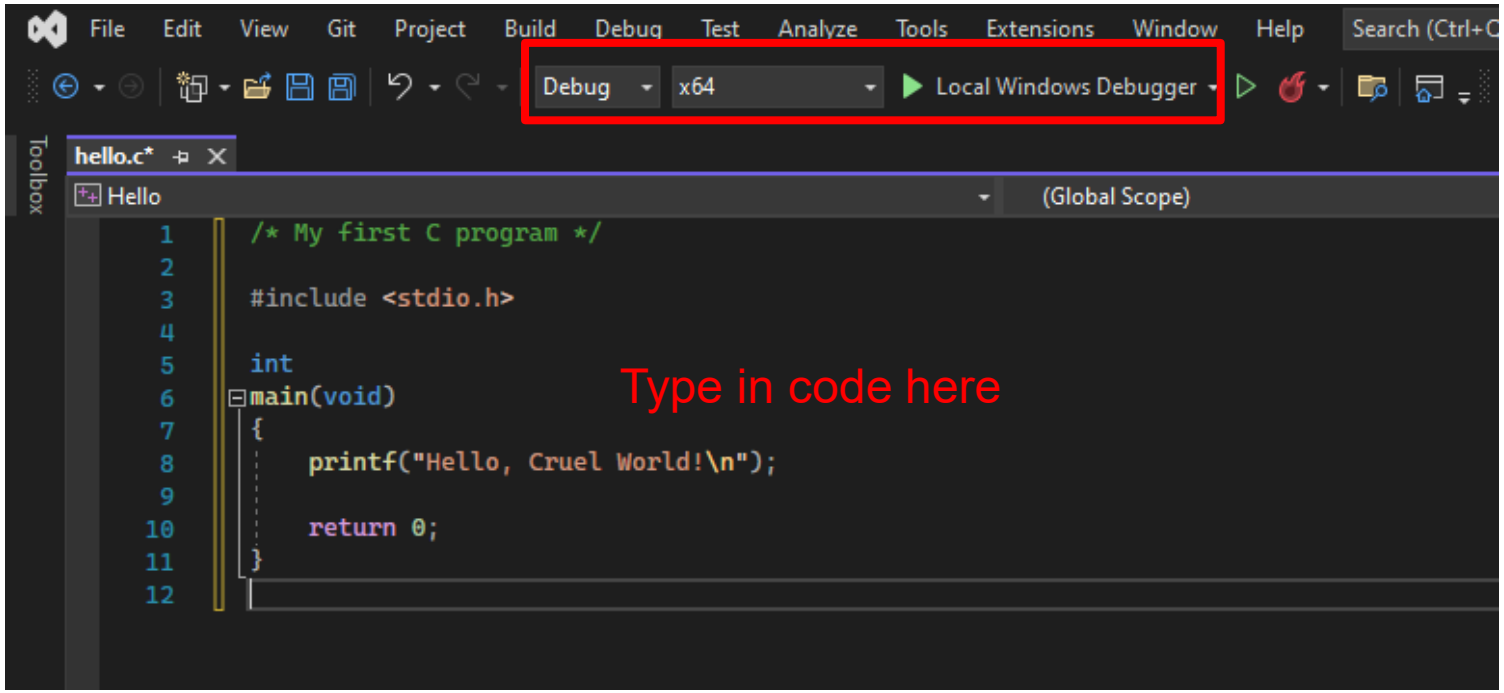
Right click on the "Source Files" category in the Solution Explorer.

Note: We will **not** normally do this, because it requires you to type in C code from scratch!

3. Click **Add** to create the empty file and add it to the project.

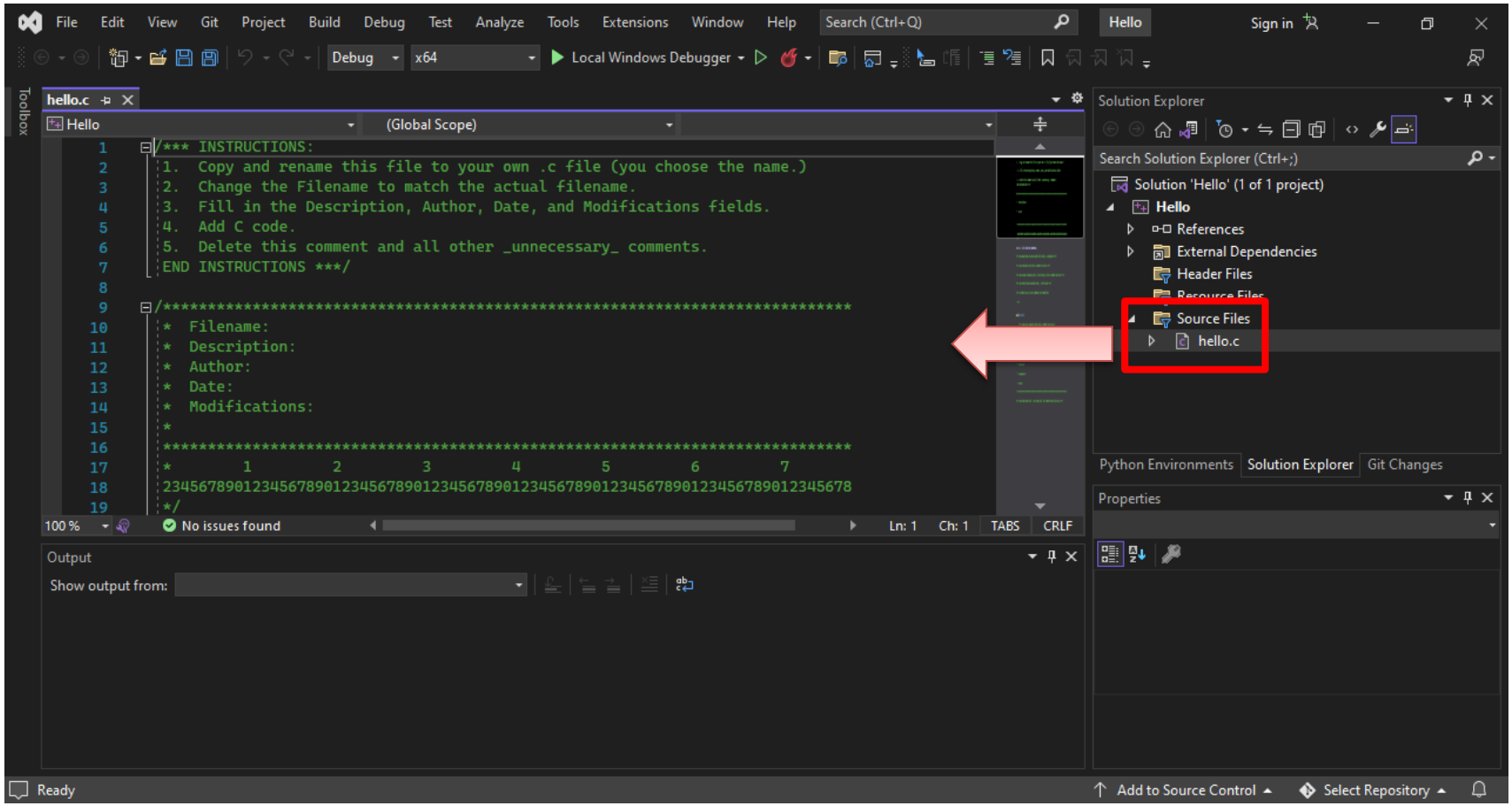
Type in code here

Editing and Building



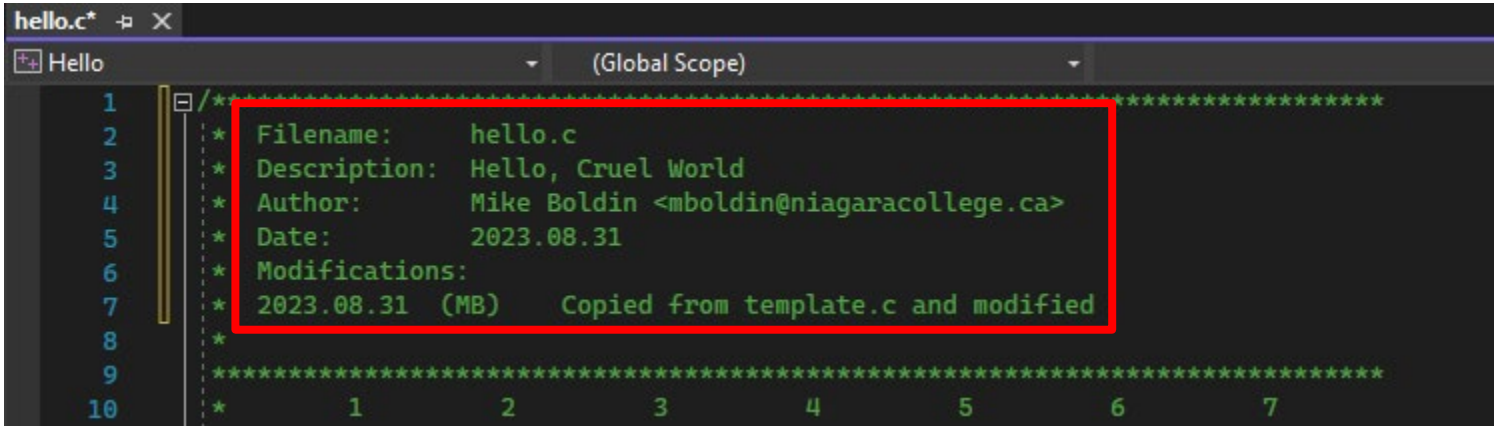
- You type in C code into the text editor pane for each **`.c`** (or `.h`) file in the project.
- The default build type is **x64 Debug**.
- Click on "Local Windows Debugger" to build and run the code.

Editing Your C File



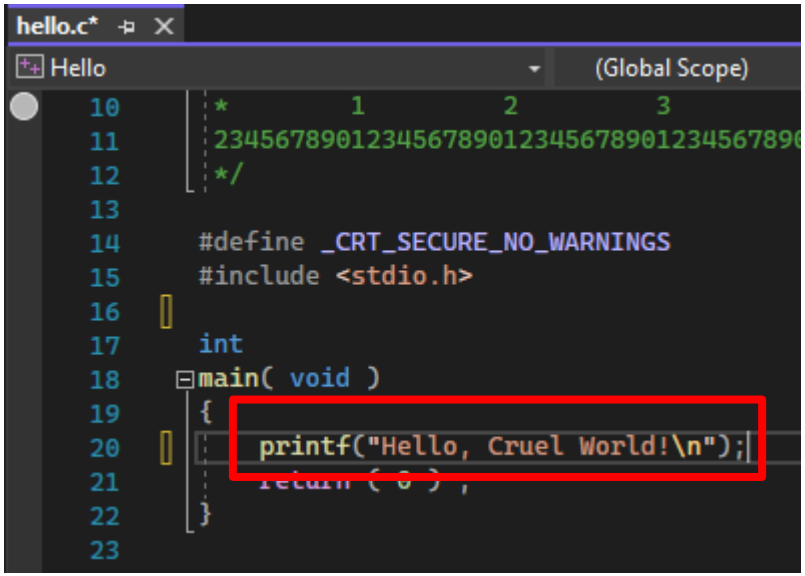
- Now that your C file is added to the project, click on the filename to open it in the Visual Studio text editor pane.

Template: Comment Block



- If you are using template.c, follow the instructions at the top of the file. (The last instruction says "delete these instructions"…)
- Fill in the comment block with the following information:
  - Filename: the name of the C file
  - Description: one sentence explaining what the program is or what the program does
  - Author: your name and email address
  - Date: when you started editing the file
  - Modifications: a list of when you edited the file, and a summary of what you did each time

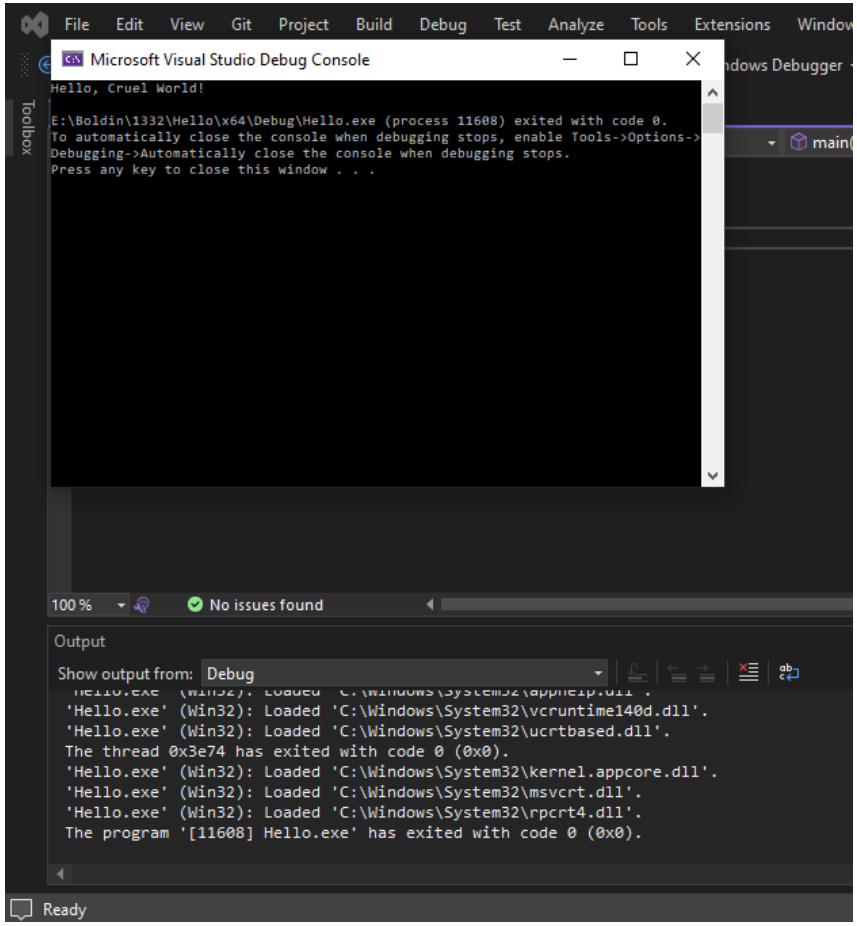
Template: Code



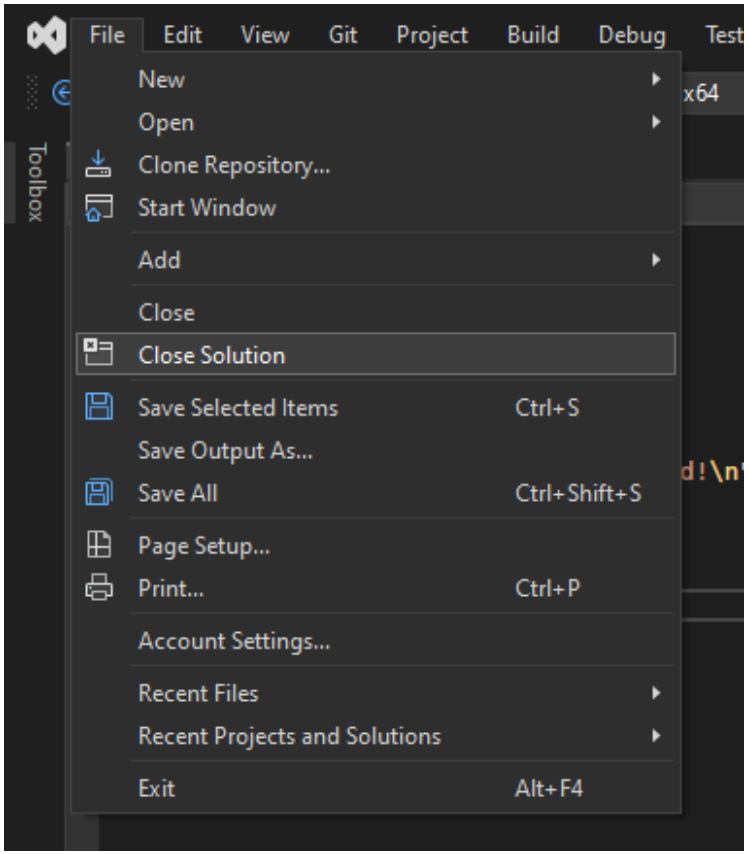
- Inside the **`main`** function, type in code that makes up the program.
- My example is very simple, so it is only one line of code!
- Visual Studio will help you with **syntax colouring** (and other things.)

Running the Program

- Click on "Local Windows Debugger" or press [F5] to run the program.
- If it works, you will see a Debug Console window, containing the program output.
- (If you made a mistake, you will see error messages in the Output pane at the bottom.)



When you are done

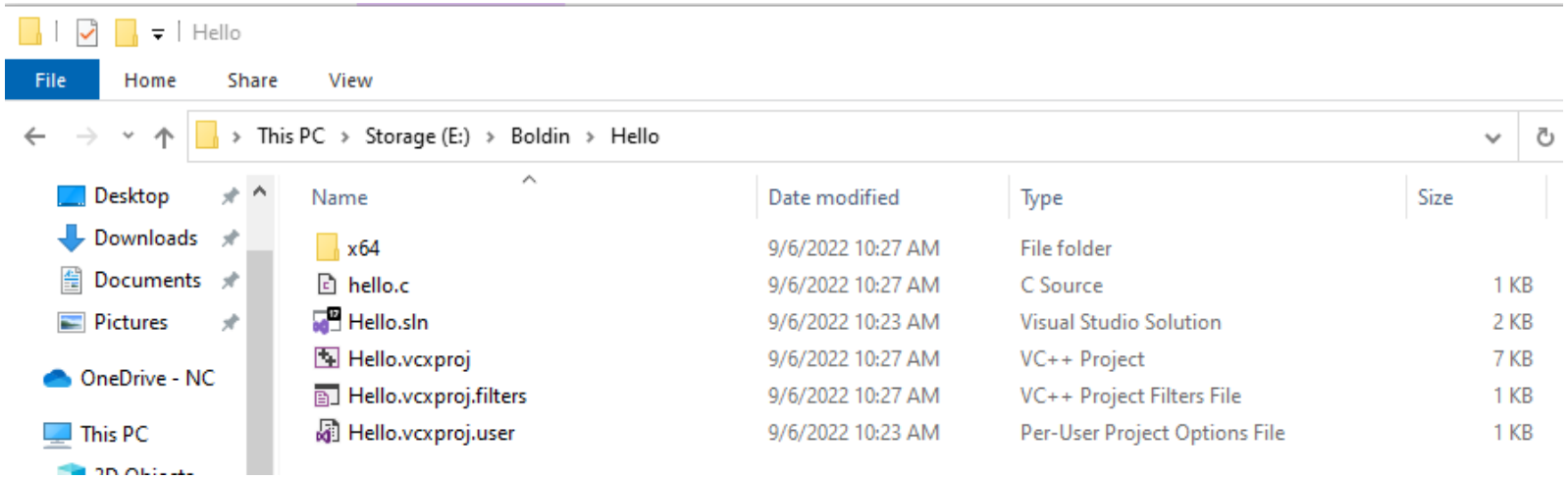


- When you are done coding, from the **File** menu, select **Close Solution** to make sure that all project files are saved.

Visual Studio 2022 Guide

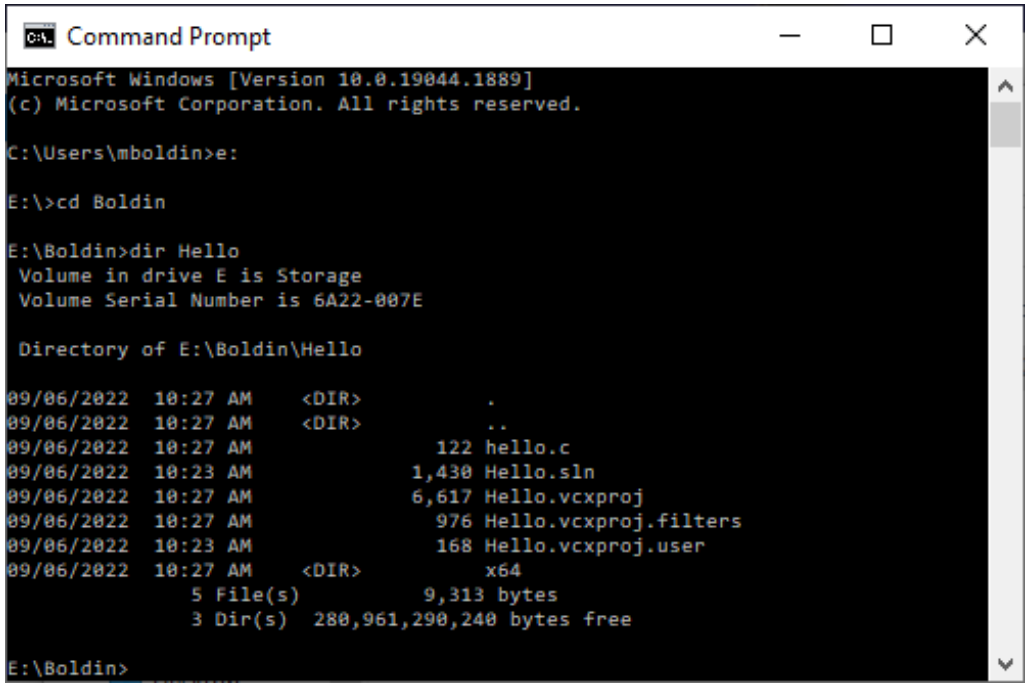
PART 2: MANAGING YOUR FILES

The resulting files and folders



- Using File Explorer to view the project folder, I can see that there are five (5) files -- four project files and one source file, and an "x64" folder, in which build files are written.

The resulting files and folders



- I can use the Command Prompt to view the same files and folder.

The resulting files and folders

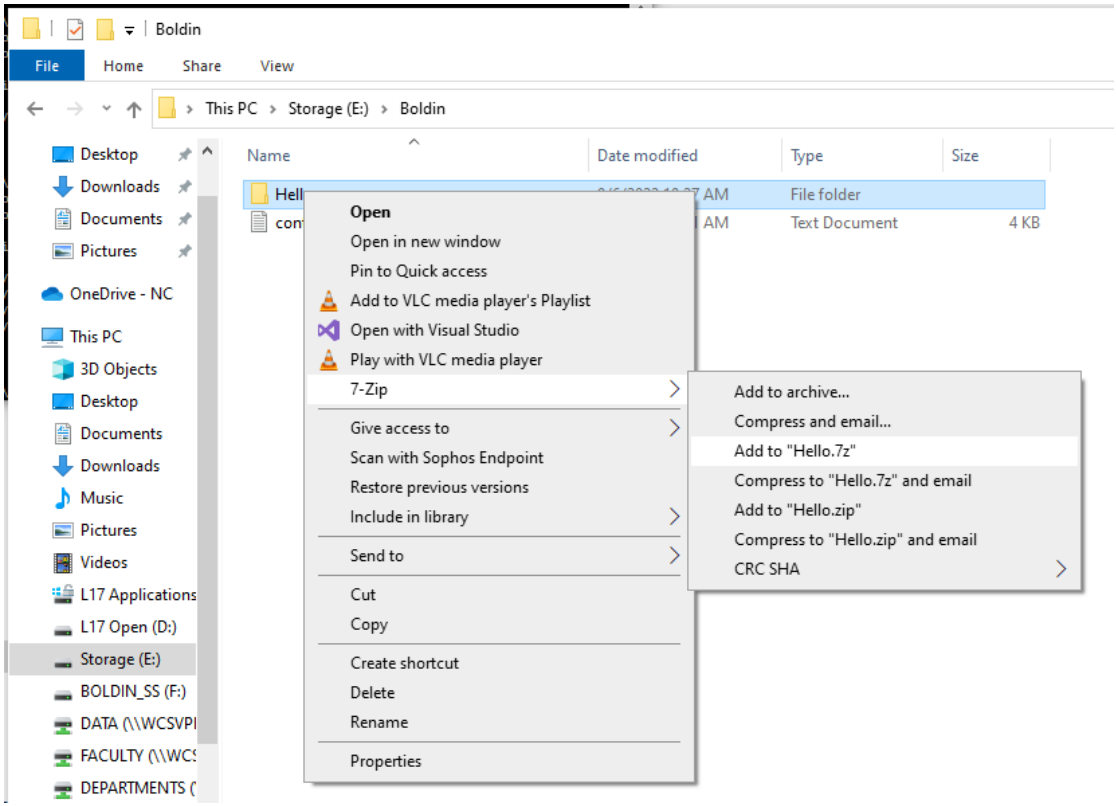
```
E:\Boldin>dir Hello /a:h
 Volume in drive E is Storage
 Volume Serial Number is 6A22-007E

 Directory of E:\Boldin\Hello

09/06/2022  10:23 AM    <DIR>          .vs
               0 File(s)              0 bytes
               1 Dir(s)  280,961,286,144 bytes free
```

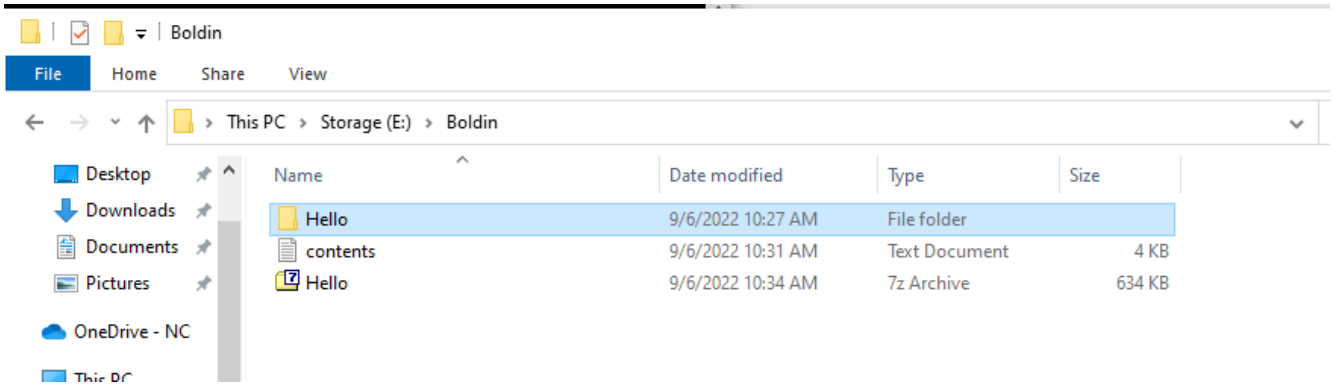
- There is also a second, hidden folder, which stores various Visual Studio settings.
- If this folder is removed or not copied, you basically need to re-create a project from scratch, and then copy the .c file to the new project.

Backing up your work



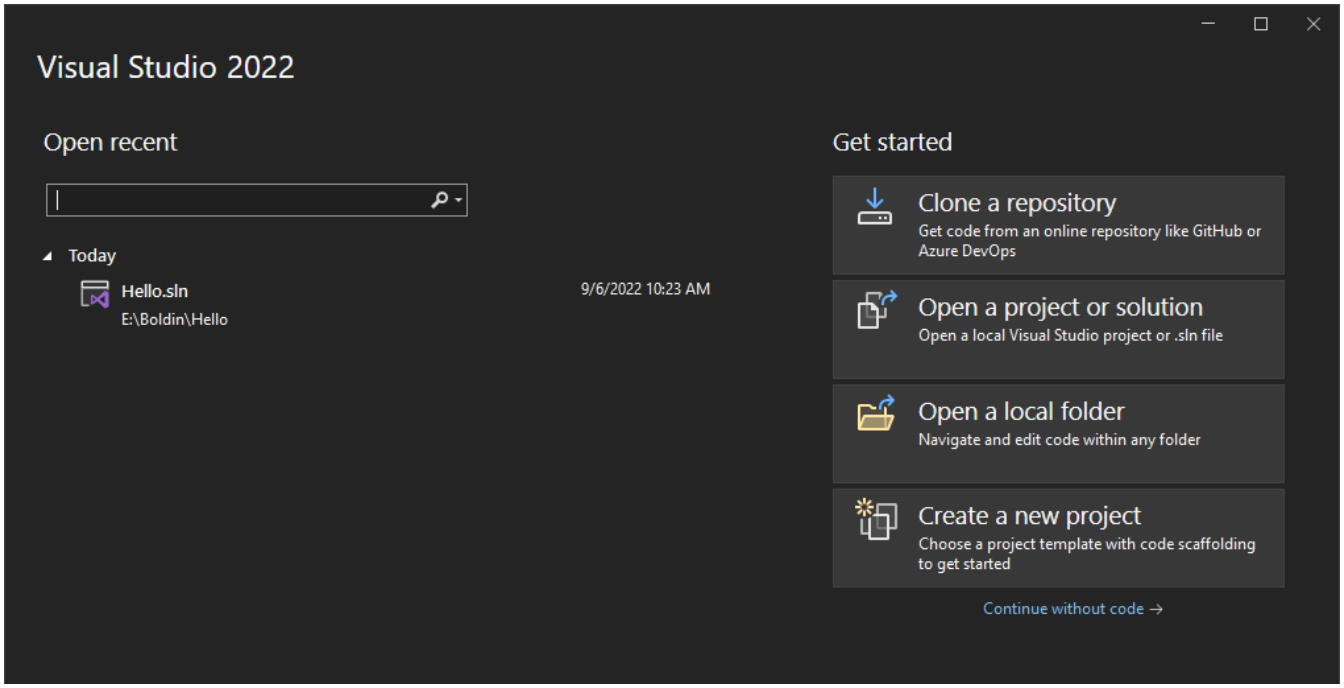
- An easy way to make a complete backup of a project is to zip the project folder.
- **7-Zip** is installed in L117 and you can create both **`.zip`** and **`.7z`** files by right-clicking on a project folder.

Backing up your work



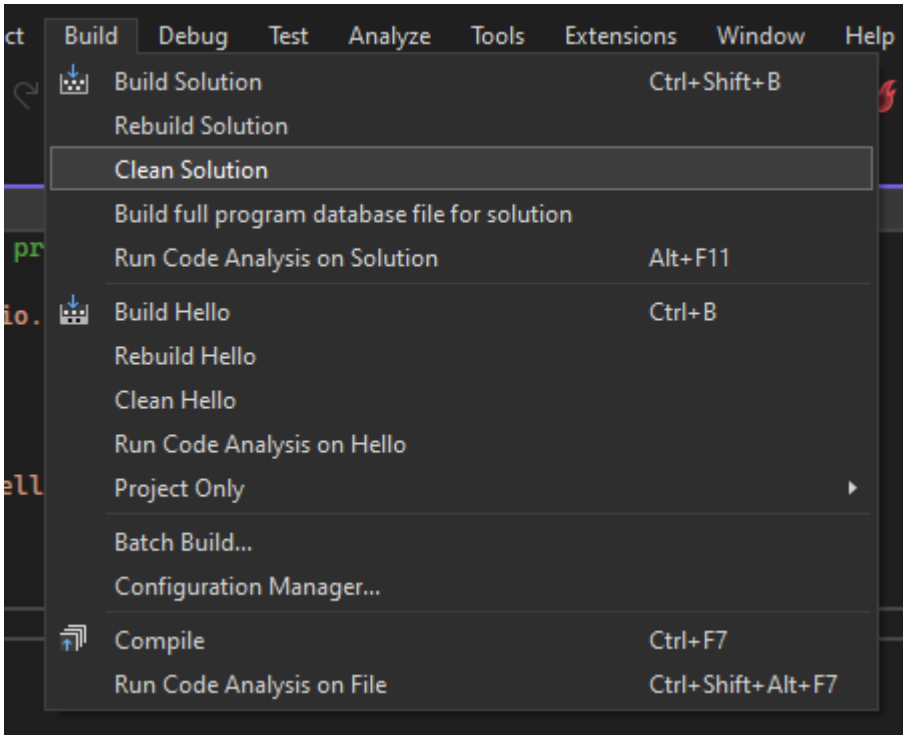
- Here, I created a 7z Archive of my project folder.
- This is great for a complete backup, but you may not be able to email the file, because it contains the Application (`.exe`) file.
- You can only keep the essential project files… to correct this now, I need to re-open the project in Visual Studio…

Re-opening a project



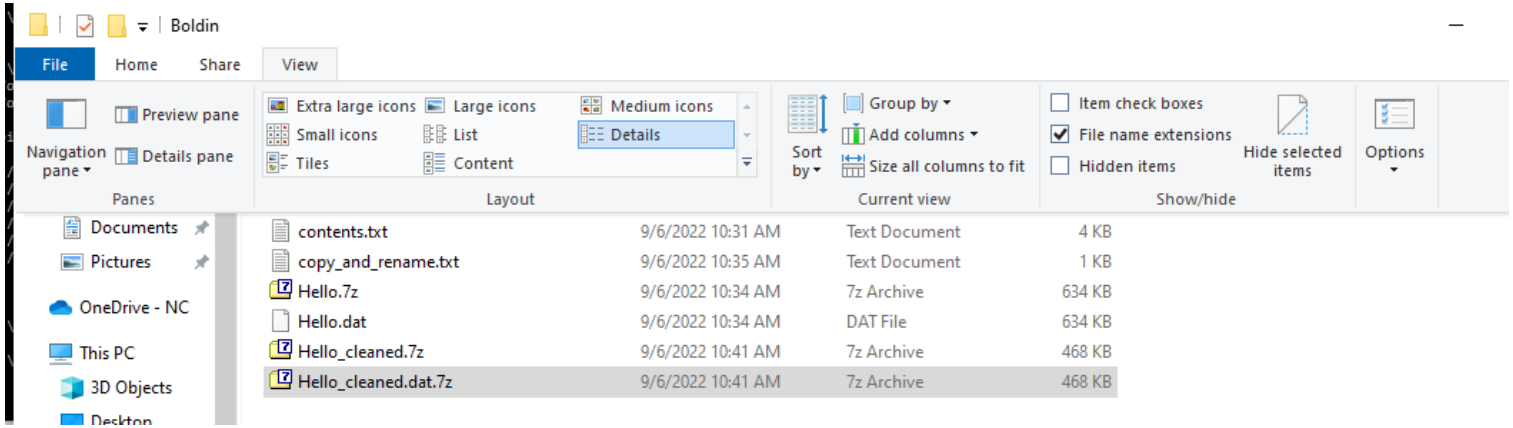
- When you restart Visual Studio during a lab session (or on your own PC), it remembers recent projects (on the left).
- But you can also choose "Open a project or solution" (on the right).

Cleaning a project



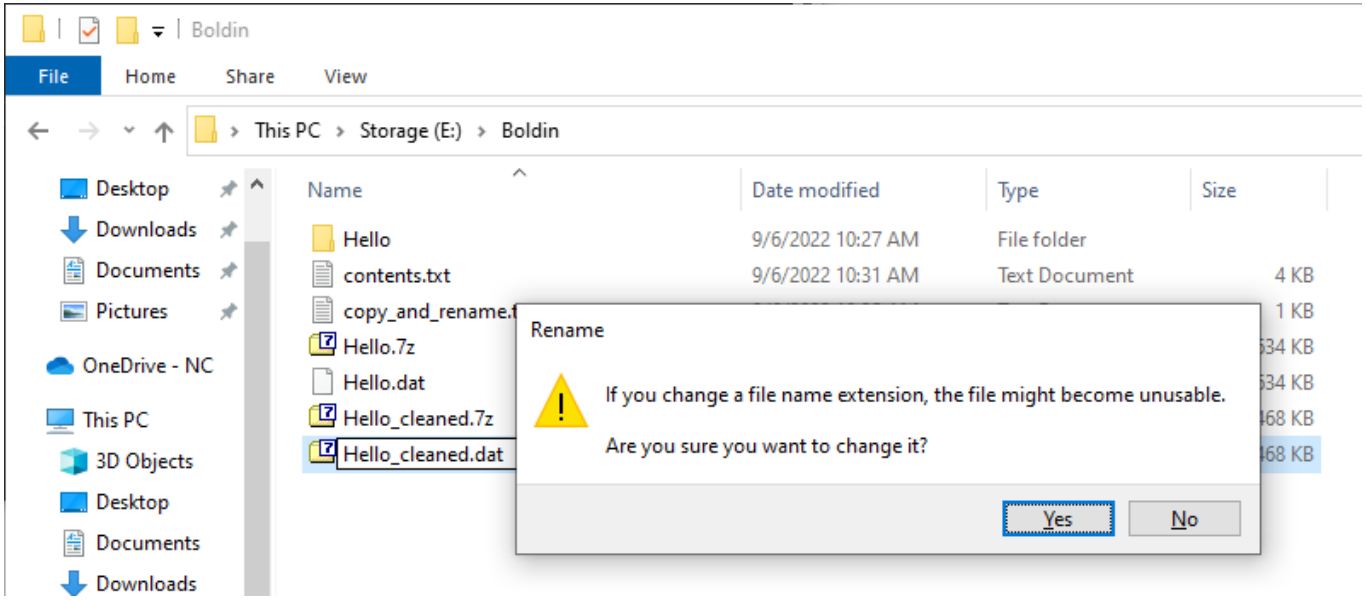
- From the **Build** menu, select "Clean Solution" to remove unnecessary build files.
- You can re-build the next time you use Visual Studio.
- This will allow you to make smaller and more portable backups.

Backing up your work



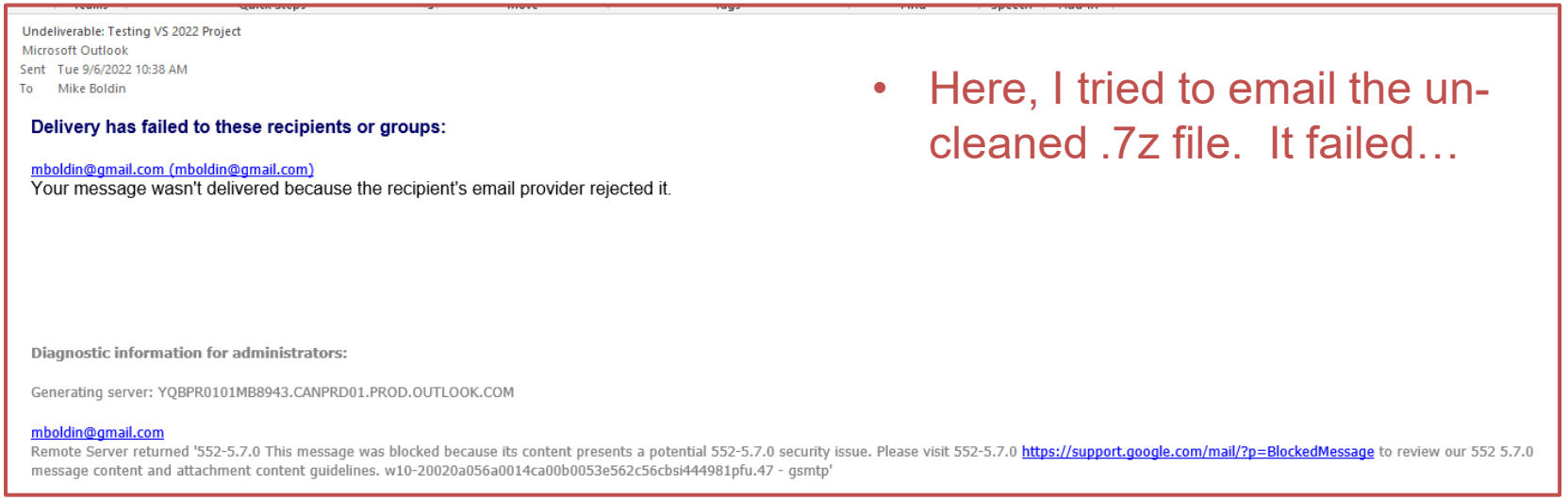
- Here I created a second 7z Archive of the cleaned project. It is smaller.
- From the View menu in File Explorer, I can select **File name extensions** to view (and rename) the extensions.
- (**Hidden items** is also here to expose hidden files and folders.)

Email your backups



- Email is a good backup tool, because it creates **multiple** copies of your attached files (Inbox, Sent Items, one to each recipient!)
- However, some email services will reject zip attachments. Instead, I can rename a `.zip` (or `.7z`) file with, say, a **`.dat`** extension.

Email your backups



Undeliverable: Testing VS 2022 Project
Microsoft Outlook
Sent Tue 9/6/2022 10:38 AM
To Mike Boldin

Delivery has failed to these recipients or groups:

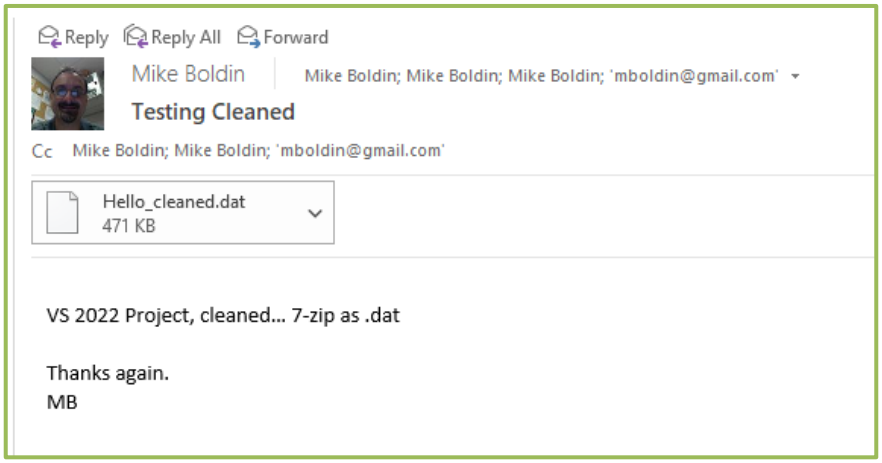
mboldin@gmail.com (mboldin@gmail.com)
Your message wasn't delivered because the recipient's email provider rejected it.

Diagnostic information for administrators:

Generating server: YQBPR0101MB8943.CANPRD01.PROD.OUTLOOK.COM

mboldin@gmail.com
Remote Server returned '552-5.7.0 This message was blocked because its content presents a potential 552-5.7.0 security issue. Please visit 552-5.7.0 https://support.google.com/mail/?p=BlockedMessage to review our 552 5.7.0 message content and attachment content guidelines. w10-20020a056a0014ca00b0053e562c56cbsi444981pfu.47 - gsmtp'

- Here, I tried to email the un-cleaned .7z file. It failed…



Reply Reply All Forward

Mike Boldin Mike Boldin; Mike Boldin; Mike Boldin; 'mboldin@gmail.com'

Testing Cleaned

Cc Mike Boldin; Mike Boldin; 'mboldin@gmail.com'

Hello_cleaned.dat
471 KB

VS 2022 Project, cleaned… 7-zip as .dat

Thanks again.
MB

- Here I **successfully** emailed the cleaned .7z file! **Four backups** were created!

You can never have too many backups!

- The "**3-2-1 backup rule**":
  - Have at least **three copies of your data**
  - Store the copies on **two different media**
  - Keep **one backup copy offsite**

https://www.veeam.com/blog/how-to-follow-the-3-2-1-backup-rule-with-veeam-backup-replication.html Retrieved on September 9, 2017

The “3-2-1 backup rule” gives you choices:

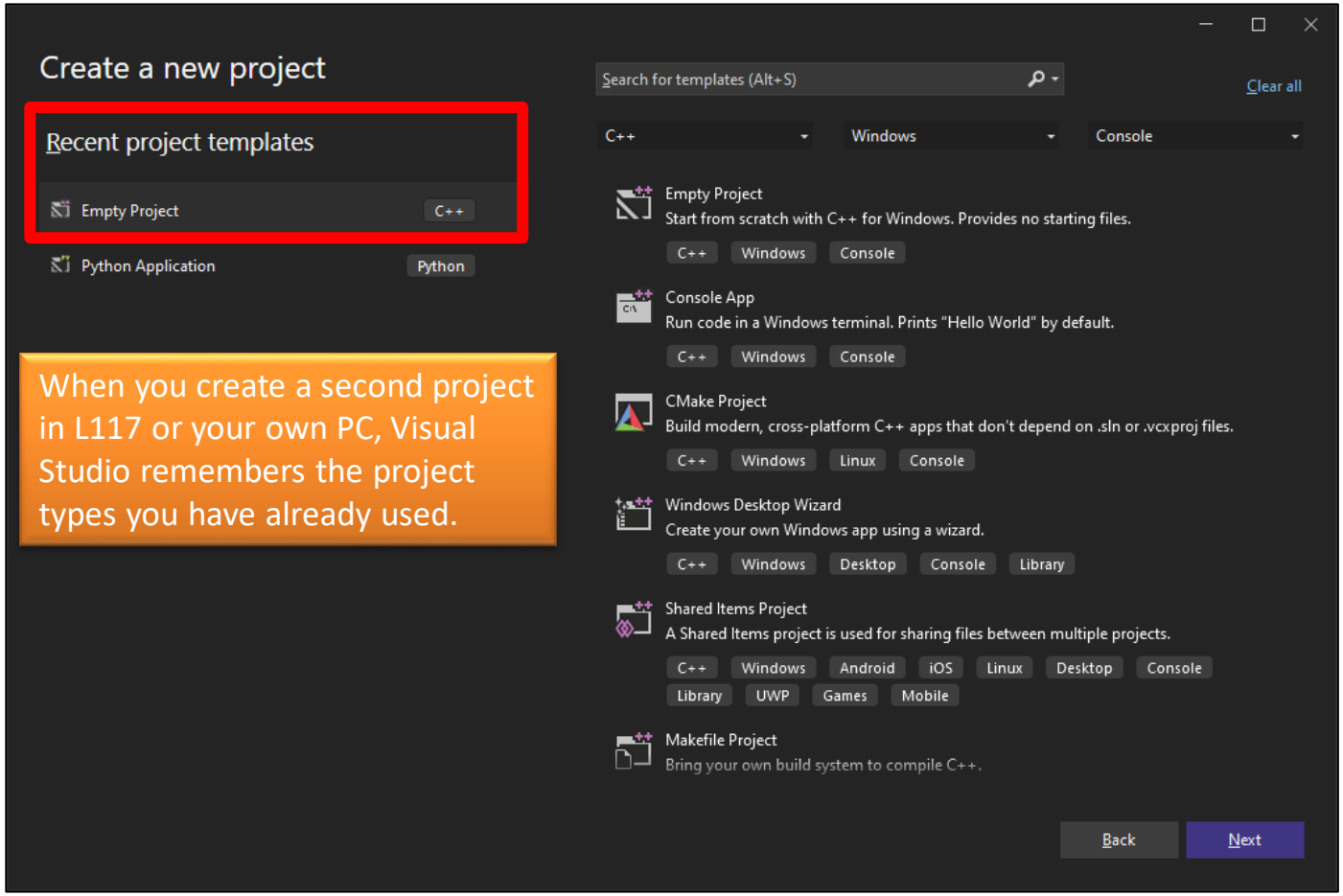
- Have at least **three copies of your data**
  - Hard disks, flash drives, optical discs, tapes, cloud services, email addresses/services
- Store the copies on **two different media**
  - Hard disk, flash, optical, tape, cloud, email
- Keep **one backup copy offsite**
  - Different physical location, cloud, email

https://www.veeam.com/blog/how-to-follow-the-3-2-1-backup-rule-with-veeam-backup-replication.html Retrieved on September 9, 2017

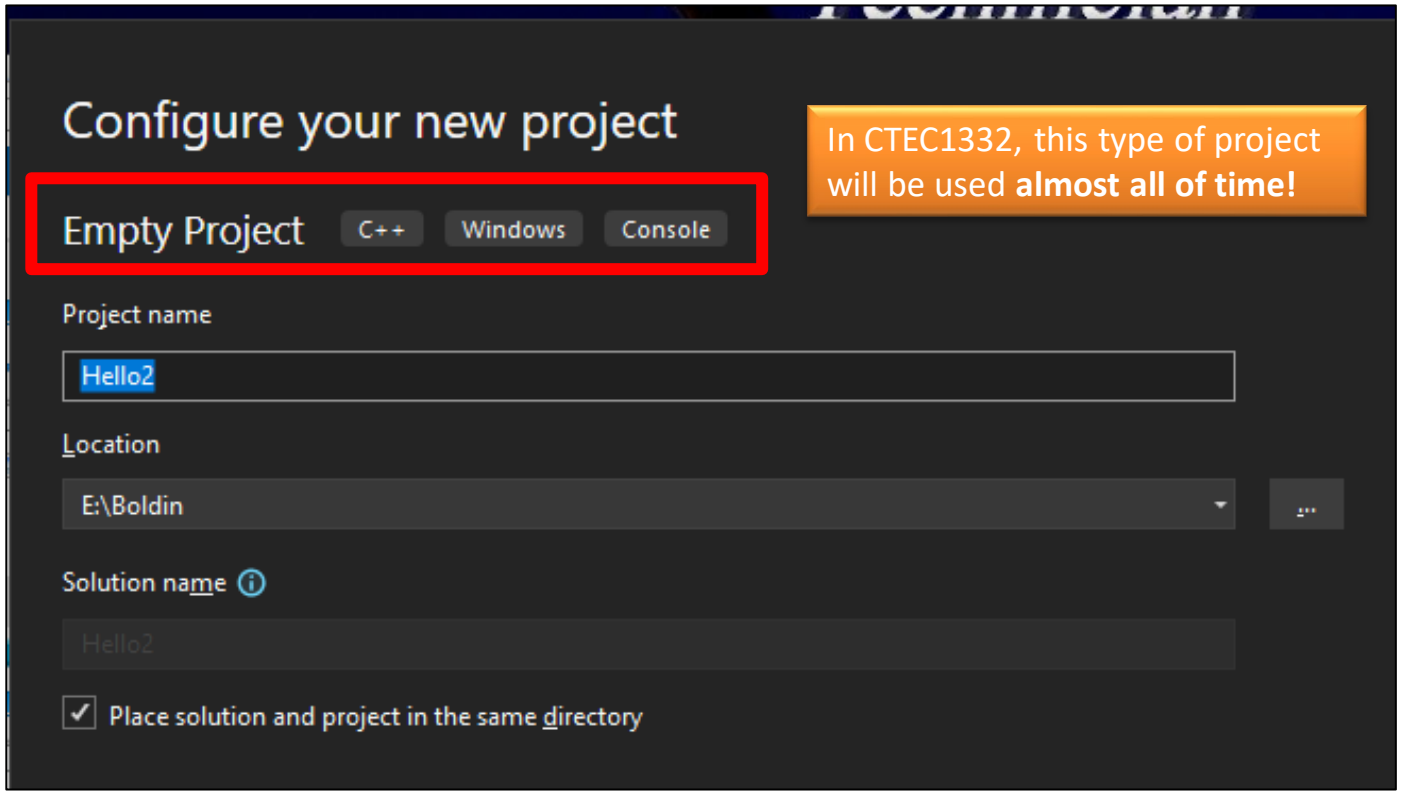
Visual Studio 2022 Guide

PART 3:
WORKING WITH EXISTING CODE

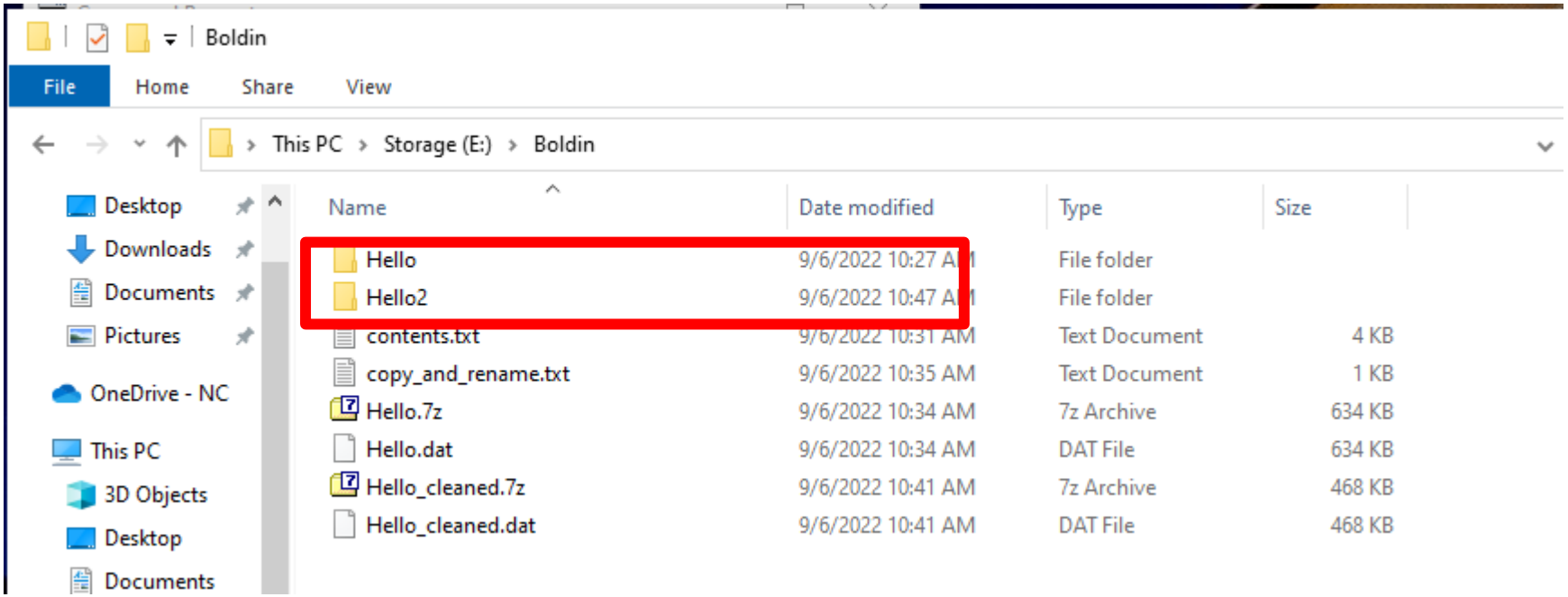
Using code from a previous project



Using code from a previous project

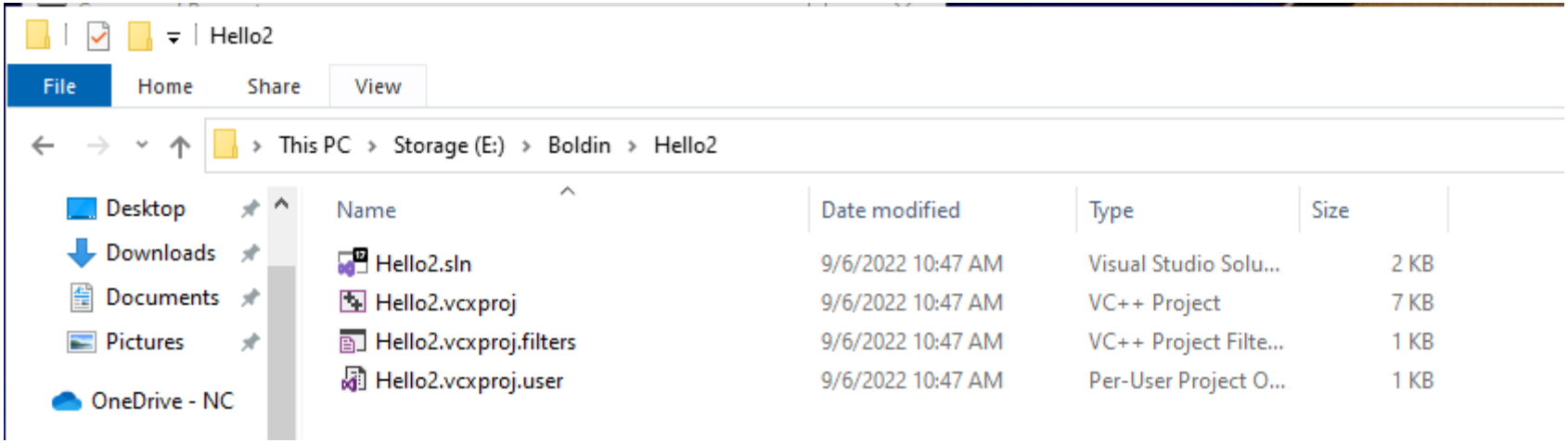


Using code from a previous project



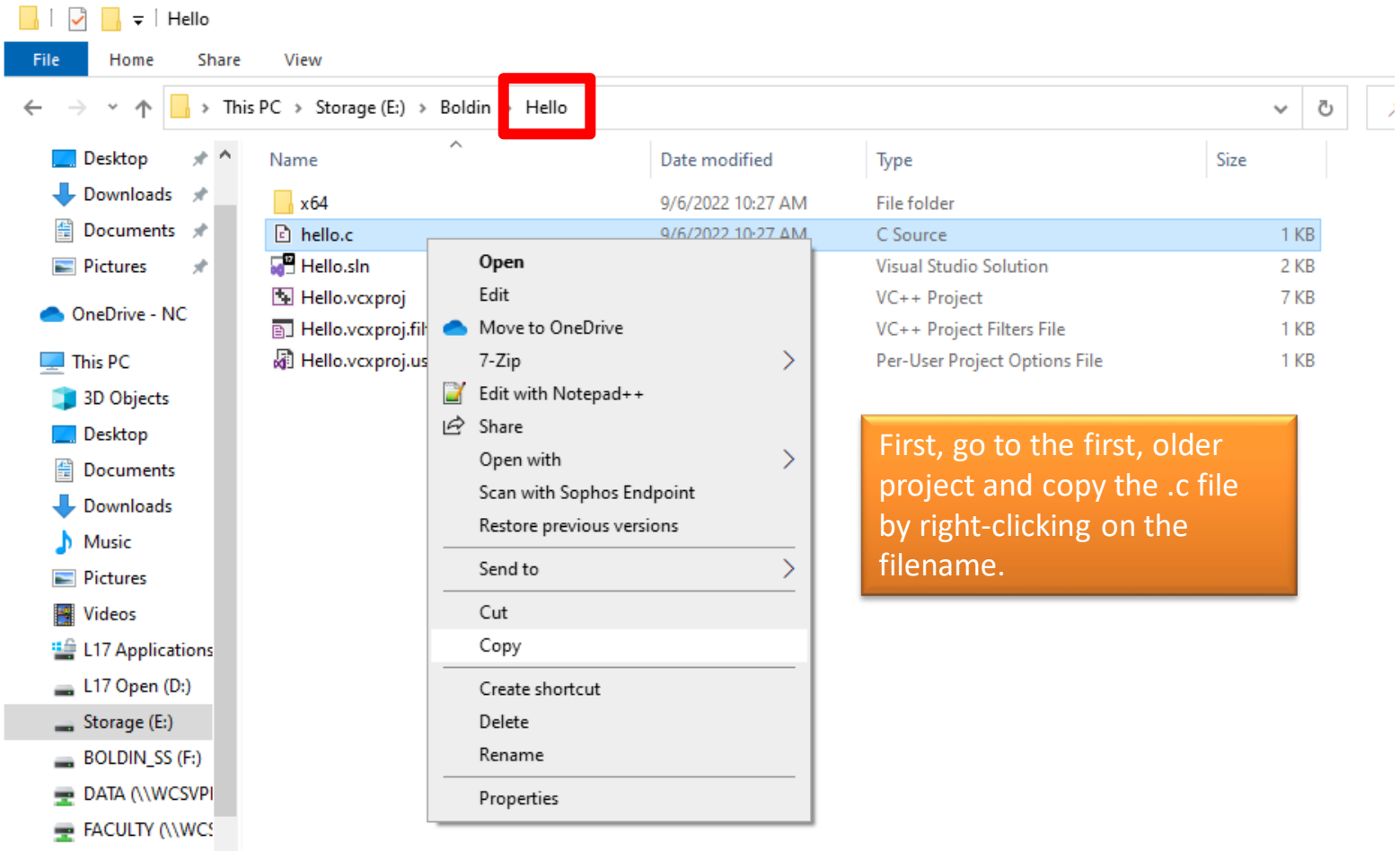
I am about to copy code from my first project to my second project

Using code from a previous project

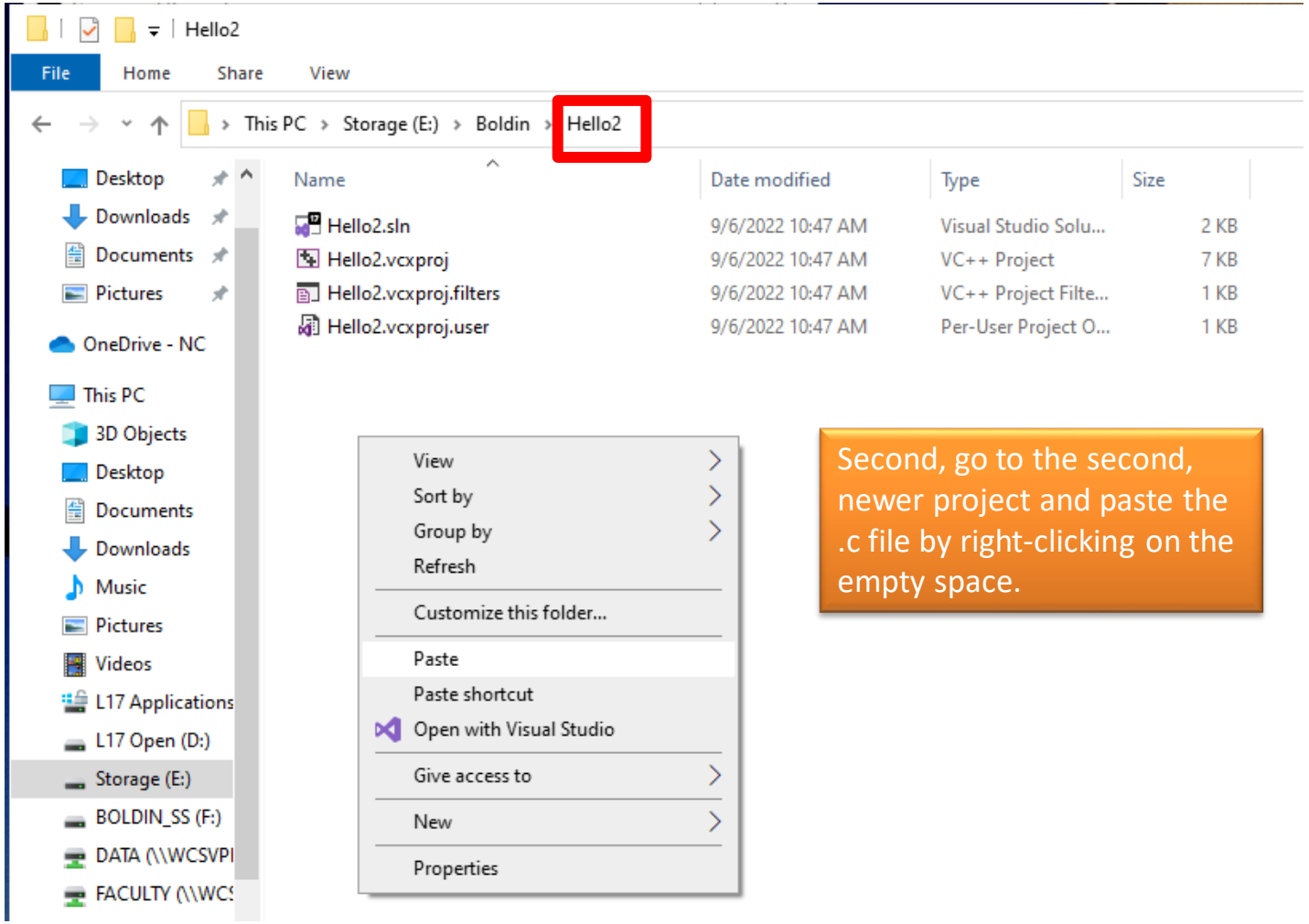


Because we are using the Empty Project template, no .c file exists in the second, newer project.

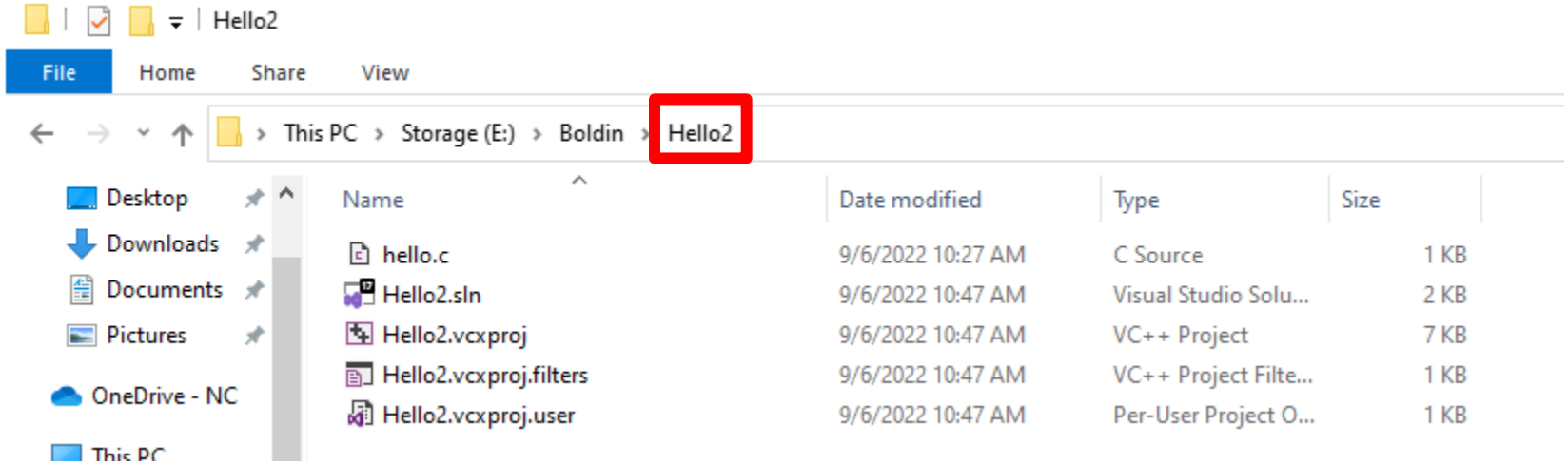
Using code from a previous project



Using code from a previous project



Using code from a previous project

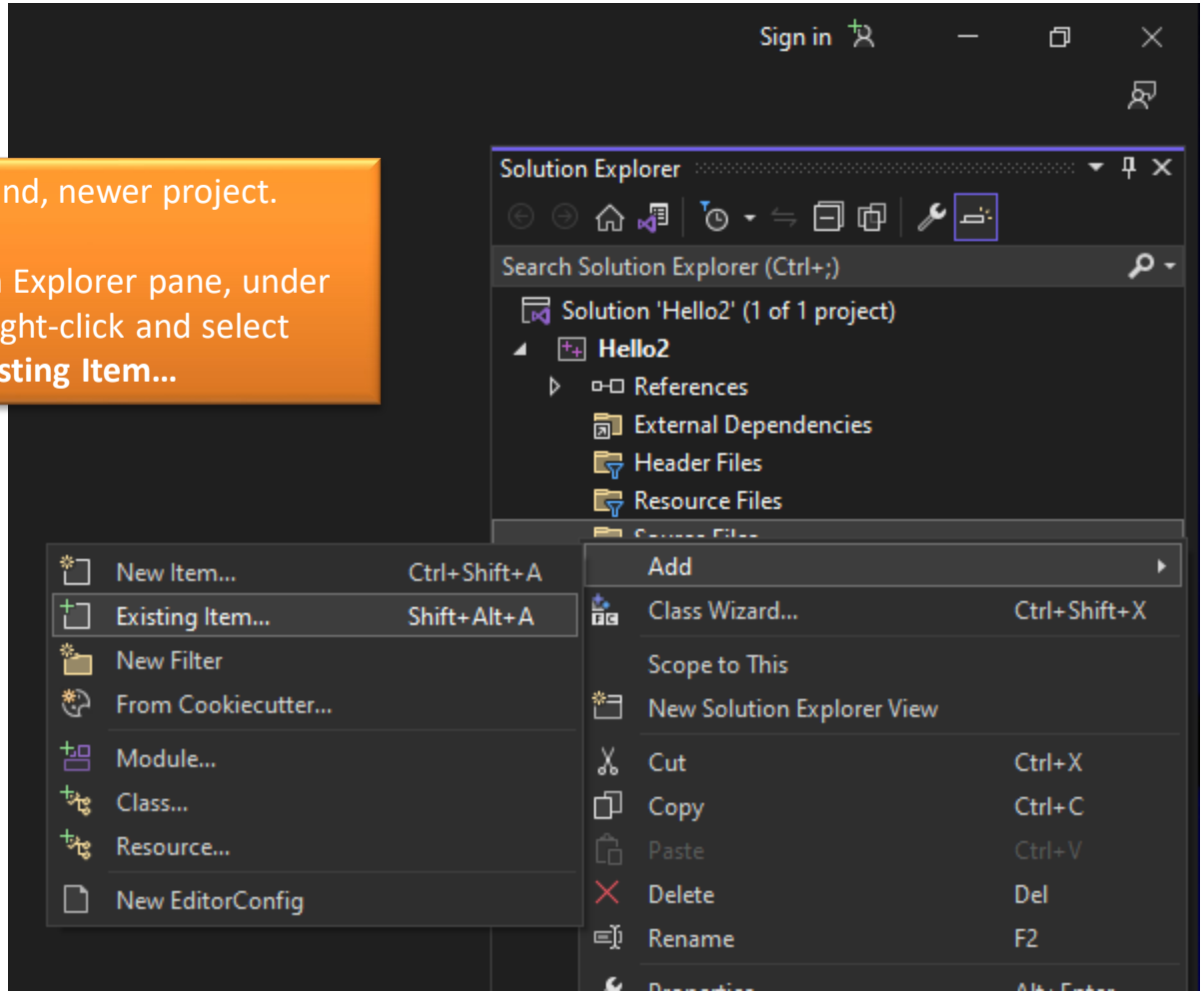


Now you have two copies of the .c file -- the **original** in the first project and the **copy** in the second project. You can start to change the copy (NOT THE ORIGINAL!)

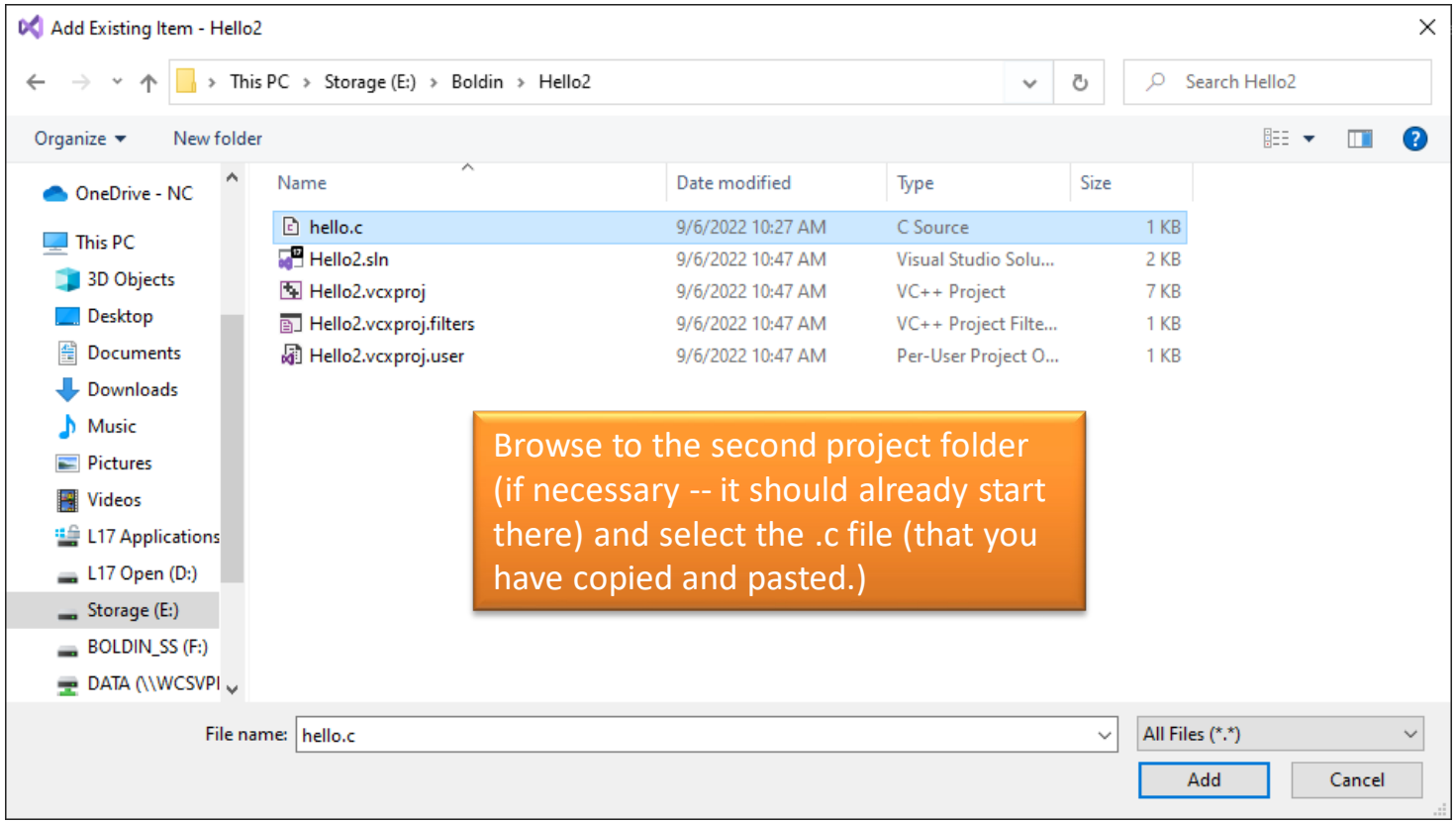
Adding an existing file in VS

Open the second, newer project.

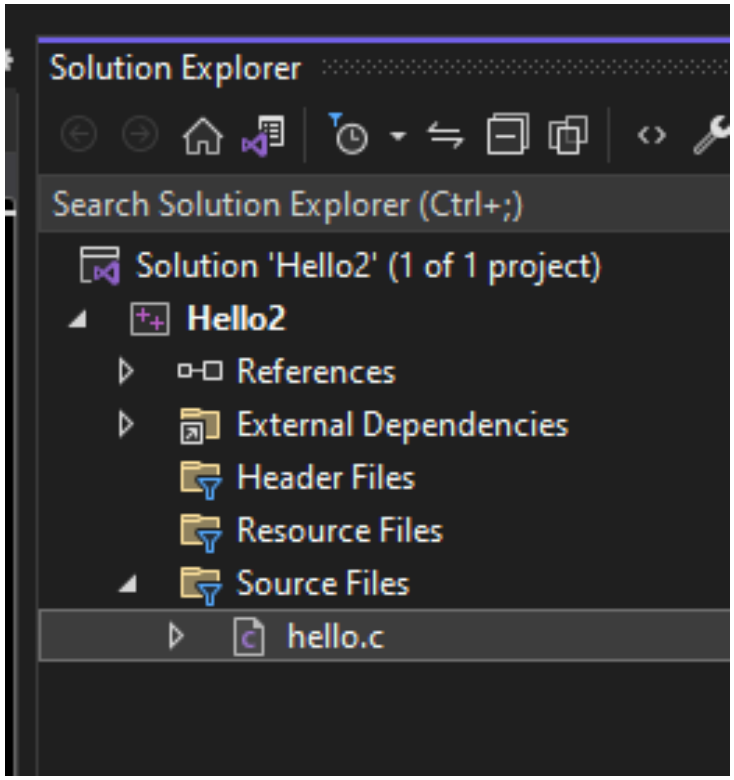
In the Solution Explorer pane, under Source Files, right-click and select Add (then) **Existing Item…**



Adding an existing file in VS



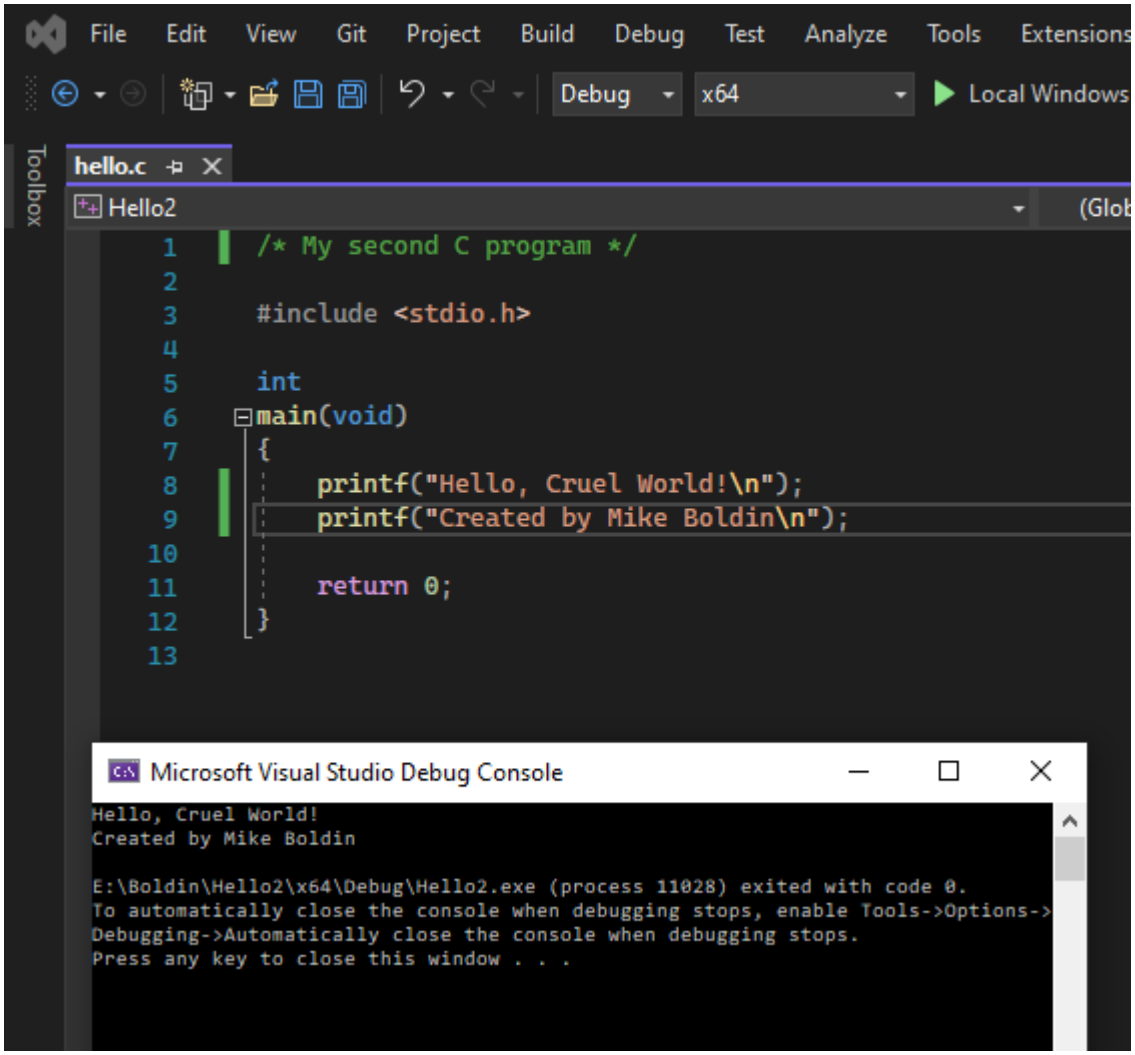
Adding an existing file in VS



Now the copied .c file is part of the second, newer project.

You can click on the filename to open it in the editor (if it doesn't open automatically.)

Modify, build and run



Here, I added a new line of C code (line 9).

I also changed the **comment** at line 1.

I build the modified program and ran it.

Important!
This technique also works with just an existing `.c` file… create the new project and copy the existing .c file to the new project folder.

Visual Studio 2022 Guide

SUMMARY

Creating a new VS2022 project for a CTEC1332 program in L117

1. Create your own folder on drive E:.

2. Download an existing .c file to your new folder (or copy it from your USB drive or One Drive NC.)

Creating a new VS2022 project for a CTEC1332 program in L117

3. Open Visual Studio 2022 and create a new Empty C++ Windows Console project.

   a) Choose a C++ Windows Console project
   b) Select Empty Project.
   c) Set the Location to your folder on drive E:.
   d) Give the project a Name.
   e) Place the solution and project in the same folder.

Creating a new VS2022 project for a CTEC1332 program in L117

4. Using File Explorer (or a Command Prompt), copy and paste the existing .c file in your new project folder. Or go to the course web site, and download `template.c`.

5. In VS, add the copied and pasted .c file to your new project.

6. Add/modify C code.

Creating a new VS2022 project for a CTEC1332 program in L117

7. Build and run your program.

8. If there are errors, correct them and repeat step 7.

9. If the program doesn't work the way you want, repeat steps 6 and 7…
   THIS IS THE HARD PART!

Creating a new VS2022 project for a CTEC1332 program in L117

10. Clean your project.

11. Close the solution.

12. Make an archive/backup of your project.
    Keep the 3-2-1 rule in mind.
    VERIFY THAT BACKUPS HAVE BEEN MADE!

Creating a new VS2022 project for a CTEC1332 program in L117

13. When you are ready to leave, **make sure** that you have done step 12, and delete your folder from drive E. **YOU ARE RESPONSIBLE FOR THIS!!!**