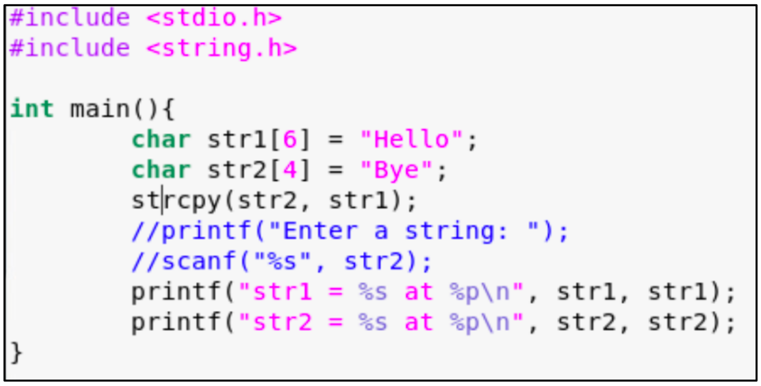
Learning Outcome: Students will gain experience with writing a C (or C++) program in a Visual Studio environment.

Part 1: Buffer Overflow

Write the following program in a file named **overflow.c** and run it on Kali Linux.



```
#include <stdio.h>
#include <string.h>

int main(){
        char str1[6] = "Hello";
        char str2[4] = "Bye";
        strcpy(str2, str1);
        //printf("Enter a string: ");
        //scanf("%s", str2);
        printf("str1 = %s at %p\n", str1, str1);
        printf("str2 = %s at %p\n", str2, str2);
}
```

1. Based on the output of the program, draw a memory diagram that includes the following information.
   a. Reference values that **str1** and **str2** hold
   b. The content of memory before and after **strcpy**

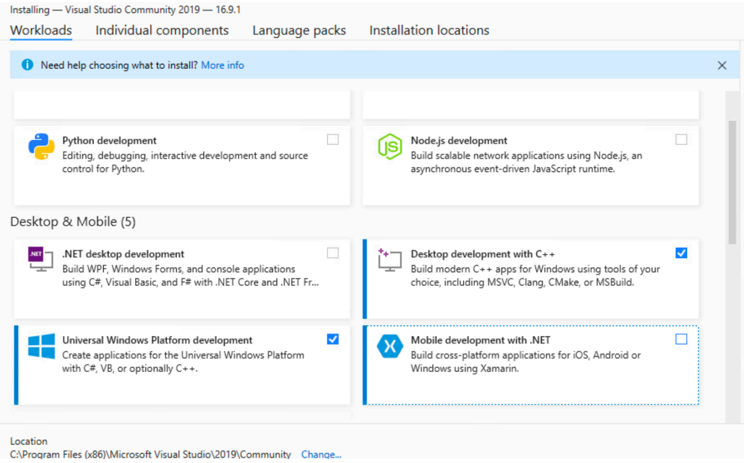
   Use/modify the provided power point (**lab7.ppt**) file to write your answer. You will need to upload it to the GitHub Assignment 7 repository.

2. Next, comment out the **strcpy** invocation and uncomment the next two lines. Note that the **scanf** function used in the program takes the user input and stores it into **str2**. Run the program using an input string of length less than 4. Observe the output. Rerun the program using strings with increasing length. Find the maximum length of the string before segmentation fault occurs. Include your answer to the **lab7.ppt** file.

Part 2: Programming in C with Visual Studio

If you have not installed Visual Studio Community 2019 on Windows (VM), please do so now. Choose the following workloads during the installation:

- Desktop development with C++
- Universal Windows Platform development



Installing — Visual Studio Community 2019 — 16.9.1

Need help choosing what to install? More info

Python development ☐
Editing, debugging, interactive development and source control for Python.

Node.js development ☐
Build scalable network applications using Node.js, an asynchronous event-driven JavaScript runtime.

Desktop & Mobile (5)

.NET desktop development ☐
Build WPF, Windows Forms, and console applications using C#, Visual Basic, and F# with .NET Core and .NET Fr...

Desktop development with C++ ☑
Build modern C++ apps for Windows using tools of your choice, including MSVC, Clang, CMake, or MSBuild.

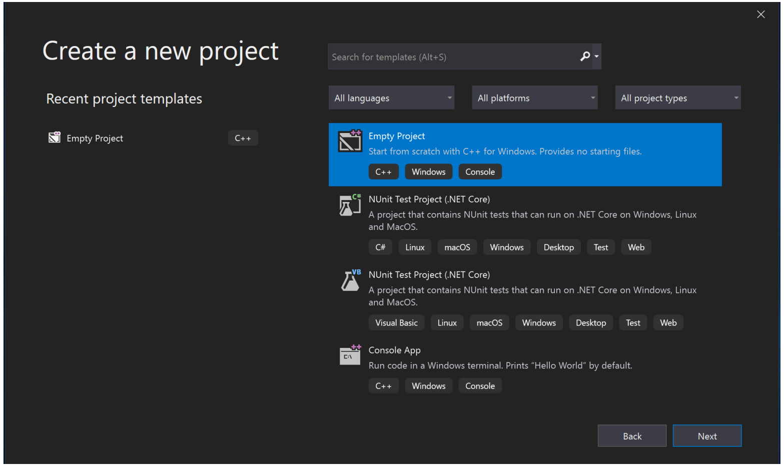
Universal Windows Platform development ☑
Create applications for the Universal Windows Platform with C#, VB, or optionally C++.

Mobile development with .NET ☐
Build cross-platform applications for iOS, Android or Windows using Xamarin.

Location
C:\Program Files (x86)\Microsoft Visual Studio\2019\Community Change...

Create a Visual Studio project to run the **firstVS.c** program as follows:

1. Choose Empty Project and click Next:



Create a new project

Recent project templates

Empty Project C++

Empty Project
Start from scratch with C++ for Windows. Provides no starting files.
C++ Windows Console

NUnit Test Project (.NET Core)
A project that contains NUnit tests that can run on .NET Core on Windows, Linux and MacOS.
C# Linux macOS Windows Desktop Test Web

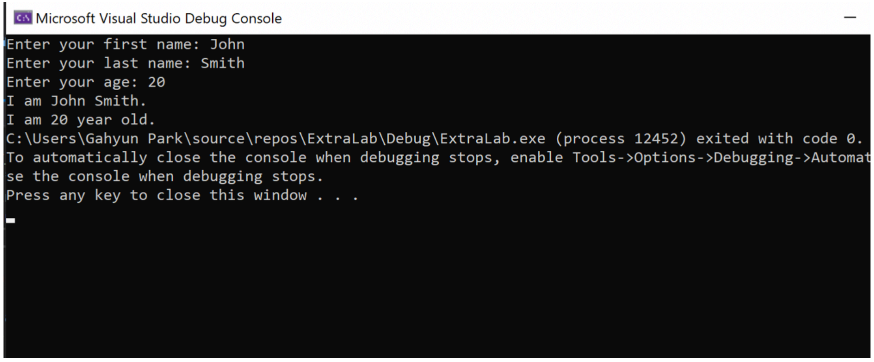
NUnit Test Project (.NET Core)
A project that contains NUnit tests that can run on .NET Core on Windows, Linux and MacOS.
Visual Basic Linux macOS Windows Desktop Test Web

Console App
Run code in a Windows terminal. Prints "Hello World" by default.
C++ Windows Console

2. Enter Project Name (e.g. Lab7):
3. On the right pane of the VS window, right click on **Source Files**, choose **Add**, and choose **New Item**…:
4. The source file name is **Source.cpp** by default. You may change it to **firstVS.c**
5. The provided code may not work with VS though it should run on Linux without any issues. You will need to read the error message and do your own research. For example, VS may consider **scanf** is not safe to use. You will need to use the **scanf_s** function instead. You will also need to google on the **sprintf** function.
6. Once you fix all errors and run it. The output may look like:

```
Enter your first name: John
Enter your age: 20
I am John.
I am 20 year old.
```

7. Next, modify **firstVS.c** so that it also takes user's last name and displays information including first and last names and age.



```
Enter your first name: John
Enter your last name: Smith
Enter your age: 20
I am John Smith.
I am 20 year old.
C:\Users\Gahyun Park\source\repos\ExtraLab\Debug\ExtraLab.exe (process 12452) exited with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automat
se the console when debugging stops.
Press any key to close this window . . .
```

8. To save signoff time, run the program using your own first and last name and take a screenshot of the output. Include the image to **lab7.ppt** file.

Deliverables:

Upload source code (**overflow.c** and **firstVS.c**) and **lab7.ppt** before 6 PM, March 24.

NAME: must be written by hand prior any sign-offs being given.

Sign offs – Each signature is worth 1/N of your lab grade where N is the number of signatures

- The student was able to understand memory layout of local variables and buffer overflow.

- The student was able to find the exact length of the longest string without causing segmentation fault.

- The student was able to modify the **firstVS.c** program as instructed and run it on Visual Studio.