Project 6x: Disassembling C on Windows Part 3 (15 pts. + 10 extra credit)

What You Need

- A Windows machine, real or virtual. I used Windows 7.
- Visual Studio Express, which you installed in a previous project.
- IDA Pro Free, which you installed in a previous project.

Purpose

You will write a small C programs using if statements, compile it, and examine it in the IDA Pro disassembler to learn what it looks like in assembly language.

Starting Visual Studio Express

Click Start, "All Programs", "Microsoft Visual Studio Express", "VS Express for Desktop".

At the "Product key" screen, click **Cancel**.

Making a New C Program

From the "Visual Studio Express 2012" menu, click **FILE**, "**New Project...**".

In the "New Project" window, on the left, expand the "**Visual C++**" container.

Click **Win32**.

In the center pane, accept the default selection of "**Win32 Console Application**".

At the bottom of the "New Project" window, type a Name of **YOURNAME-6xa**, replacing "YOURNAME" with your own name. Do not use any spaces in the name.

In the "Location" line, click the **Browse** button and navigate to a folder you have permission to save files in, such as your desktop.

Click the "**Select folder**" button.

In the "New Project" window, click **OK**.

A box opens, titled "Welcome to the Win32 Application Wizard".

Click **Next**. In the next screen, accept the default settings and click **Finish**.

A window opens, showing a simple C program.

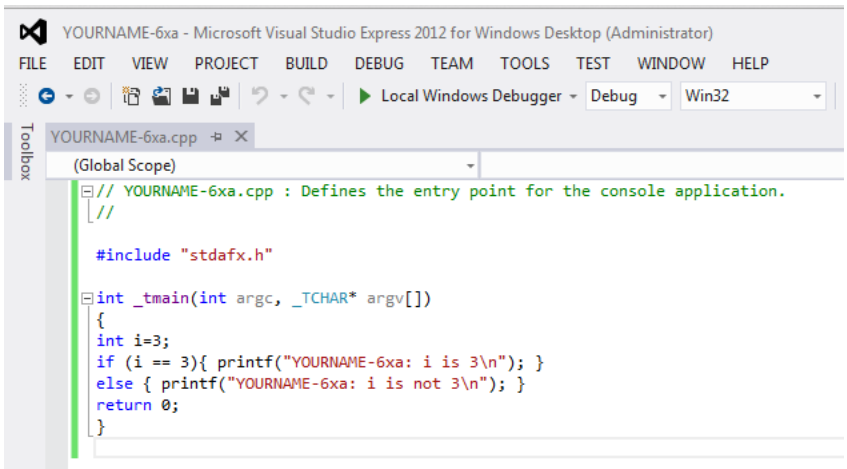
Modify this program to match the code shown in text and the image below.

Do not use the literal string "YOURNAME"--replace it with your own name.

```
// YOURNAME-6xa.cpp : Defines the entry point for the console application.
//

#include "stdafx.h"

int _tmain(int argc, _TCHAR* argv[])
{
int i=3;
if (i == 3){ printf("YOURNAME-6xa: i is 3\n"); }
else { printf("YOURNAME-6xa: i is not 3\n"); }
return 0;
}
```



Compiling your Program

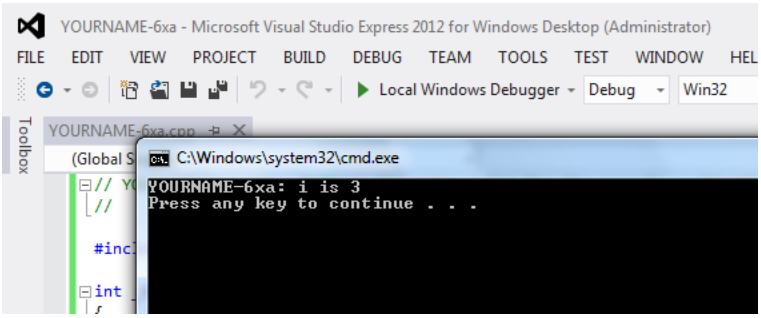
Click **BUILD**, "**Build Solution**".

You should see the message "Build: 1 succeeded" at the bottom of the window. If you see errors, you need to correct them and re-compile the program.

Running your Program

Click **DEBUG**, "**Start Without Debugging**".

A Command Prompt window opens, showing the output of "YOURNAME-6xa: i is 3", as shown below:



Disassembling the EXE

Click in the Command Prompt window, and press Enter to close it.

Minimize the Visual Studio Express window.

Start IDA Pro Free.

In the "About" box, click **OK**.

Agree to the license.

Close the Help window.

In the "Welcome to IDA!" box, click the **New** button.

In the "New disassembly database" box, double-click "**PE Executable**".

In the "Select PE Executable to disassemble" box, navigate to the folder you used to save your program in Visual Studio Express, probably your desktop.

Double-click the "YOURNAME-6xa" folder.

Double-click the **Debug** folder.

Double-click the **YOURNAME-6xa.exe** file.

In the "PE Executable file loading Wizard", click **Next**, **Next**, **Finish**.

A box appears, saying this file was linked with debug information.

Click **Yes**

IDA Pro loads the file. As before, the graph mode doesn't show the interesting part of the program.

Expand the **Strings**. Double-click one of the strings containing "**YOURNAME-6xa**".

The location containing the string appears.

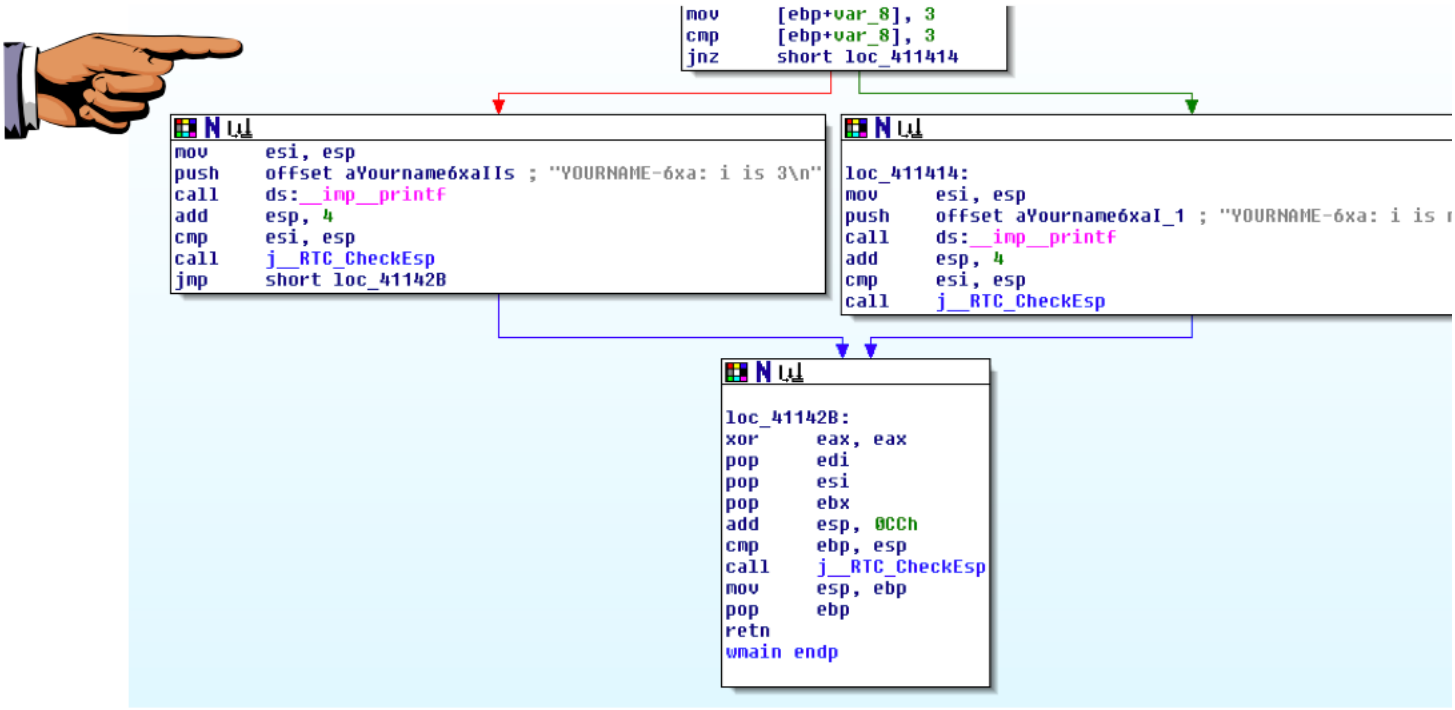
To the right of "YOURNAME-6xa" there is a "DATA XREF" comment. To the right of the "XREF", double-click "**wmain**".

Now the assembly code that performs the task you wrote in C appears, as shown below.

IDA Pro's graph mode makes if statements easy to understand!

The top box ends with a **cmp** operation (compare two numbers), and a **jnz** operation (Jump if Not Zero).

The red arrow shows the path taken if the condition is false, and the green arrow shows the path taken if the condition is true.



Saving the Screen Image

Make sure your image contains these items:

- A box at the top with **two arrows** coming out of it, one red and one green
- Both the boxes the arrows point to should contain **YOURNAME**

On your keyboard, press the PrntScrn key.

Click **Start**, type in **PAINT**, and open Paint.

Press **Ctrl+V** to paste in the image of your desktop.

YOU MUST SUBMIT WHOLE-DESKTOP IMAGES TO GET FULL CREDIT.

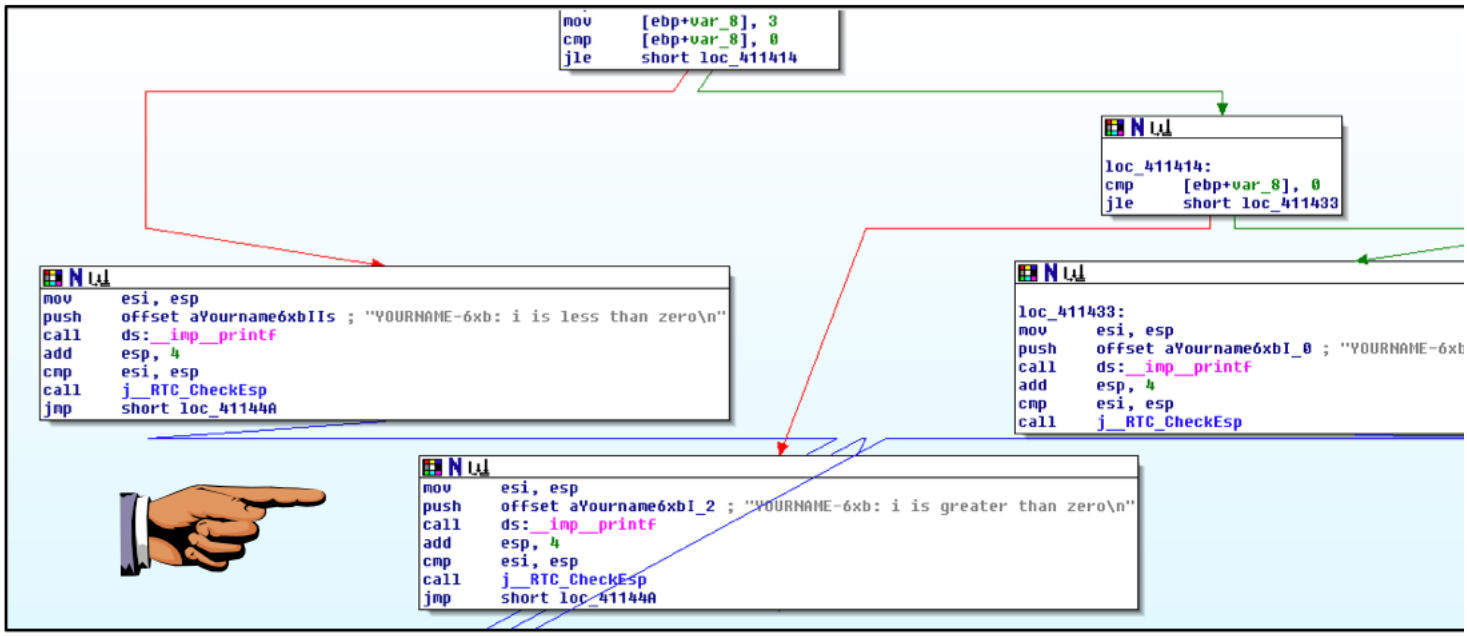
Save the image with a filename of "**Proj 6xa from YOUR NAME**".

CHALLENGE: 10 Pts. Extra Credit

Modify the C program to perform a three-way test, to see if a variable is less than zero, equal to zero, or greater than zero.

Print appropriate messages containing your name in all three cases.

Compile it and disassemble it, producing assembly code similar to that shown below.



It must show these features:

- **Two branches**: two boxes showing two arrows emerging, one red and one green.
- **Three destination boxes** showing **YOUR NAME** in each one.

Turning in Your Project

Email the images to: **cnit.126sam@gmail.com** with a subject line of **Proj 6x From Your Name**, replacing Your Name with your own first and last name. Send a Cc to yourself.

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