

Note: Some of the window formats and Button positions have changed, but you should be able to make the appropriate translation.

ECE 540 Tools Installation Guide

NOTE: WE ARE PROVIDING THESE INSTRUCTIONS FOR THOSE OF YOU WHO HAVE, OR ARE PLANNING TO, PROCURE YOUR OWN NEXYS4 DDR BOARD AND BUS BLASTER AND RUN THE TOOLS ON YOUR OWN PC. THERE ARE ADVANTAGES TO HAVING THE TOOLS RESIDENT ON YOUR PC SO THAT YOU DO NOT HAVE TO TRAVEL TO ONE OF THE LABS. IT IS YOUR CHOICE, THOUGH. WE FEEL THAT THERE ARE SUFFICIENT WORKSTATIONS AVAILABLE IN BOTH THE FAB DIGITAL SYSTEMS/CAPSTONE LAB AND THE WCC LAB IN RM 313.

1. Installing Vivado

The steps below describe how to install Vivado 2018.2, which is freely available from Xilinx Inc. on a computer running the 64-bit Windows operating system. (Note that Vivado is also available for the Linux operating system but there is no native MacOS port)

Step 1. Download the installation file

Step 2. Open and execute the installation file

Step 1. Download the installation file

Browse to the Xilinx download website:

<http://www.xilinx.com/support/download.html>

You will see the webpage in Figure 1.

Version

2018.2

2018.1

2017.4

Archive

Vivado Design Suite - HLx Editions: Update 1 - 2018.2

Important

Vivado Design Suite 2018.2.1 is now available with support for

Production Devices

- Zynq UltraScale+ MPSoC (-3) Devices
 - XCZU4EG/EV, XCZU5EG/EV, XCZU6EG, XCZU7EG/EV, XCZU9EG
- Kintex UltraScale+ FPGA (-3) Devices: - XCKU9P
- Zynq UltraScale+ RFSoC (-1L, -2LI) Devices:
 - XCZU21DR, XCZU25DR, XCZU27DR, XCZU28DR, XCZU29DR
- Spartan-7 Devices:
 - Spartan-7: XC7S75(-1Q), XA7S75 (-1,-2,-1Q), XC7S100(-1Q), XA7S100 (-1,-2 -1Q) , XA7S6(-1, -2, -1Q), XA7S15(-1, -2, -1Q)

Figure 1. Xilinx download page

Find the Vivado 2018.2 Windows Web Installer, as shown in Figure 2.

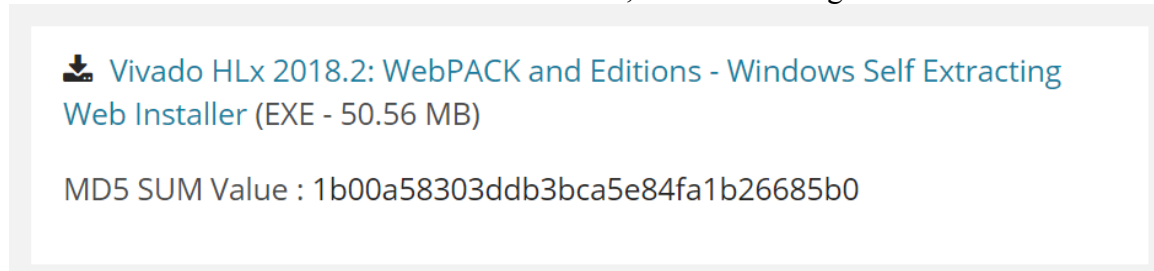


Figure 2. Download Vivado installation file

You will be taken to the Xilinx sign in page, as shown in Figure 3. If you don't already have a Xilinx account, click on **Create your account**. Creating an account is free.

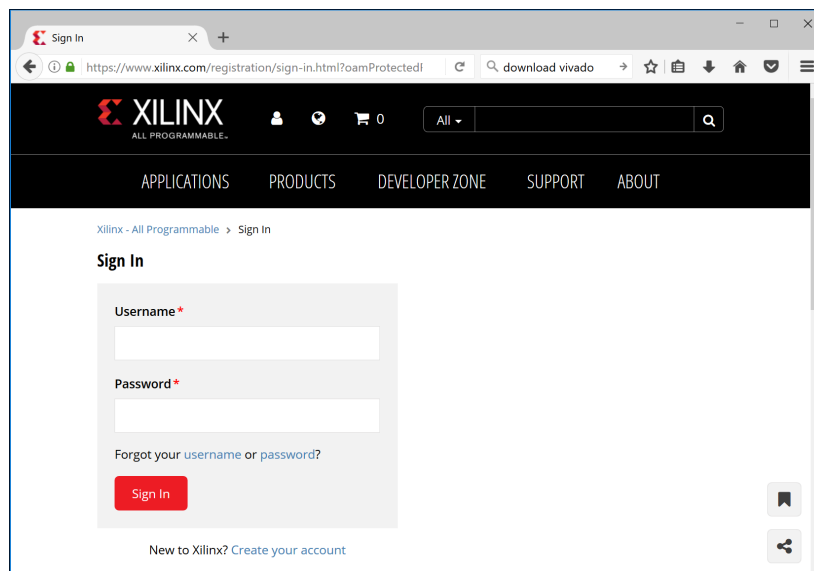


Figure 3. Xilinx sign in page

After you have signed in, the website will prompt you to enter your name, address, etc., as shown in Figure 4. After entering your information, click on **Next** at the bottom of the web page.

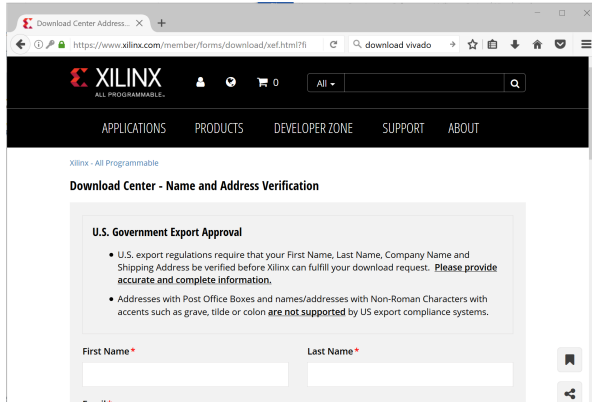


Figure 4. Download center name/address entry form

A pop-up window now gives you the option to save the installation executable. Save the file where ever is convenient (a temporary location is fine).

Step 2. Open the installation file

After the installation executable has downloaded, browse to where you saved it, and double-click on it to open it and start the installation. Now the Xilinx Installer will be extracted, as shown in Figure 5.

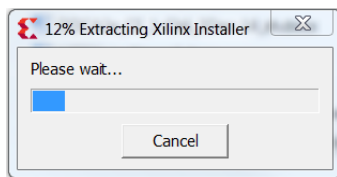


Figure 5. Xilinx installer extraction progress window

You may be asked if you want the Xilinx program to make changes to your computer. Click Yes.

VIVADO.
HLx Editions



The Vivado 2018.2 Installer window will now open, as shown in Figure 6. Click **Next**.

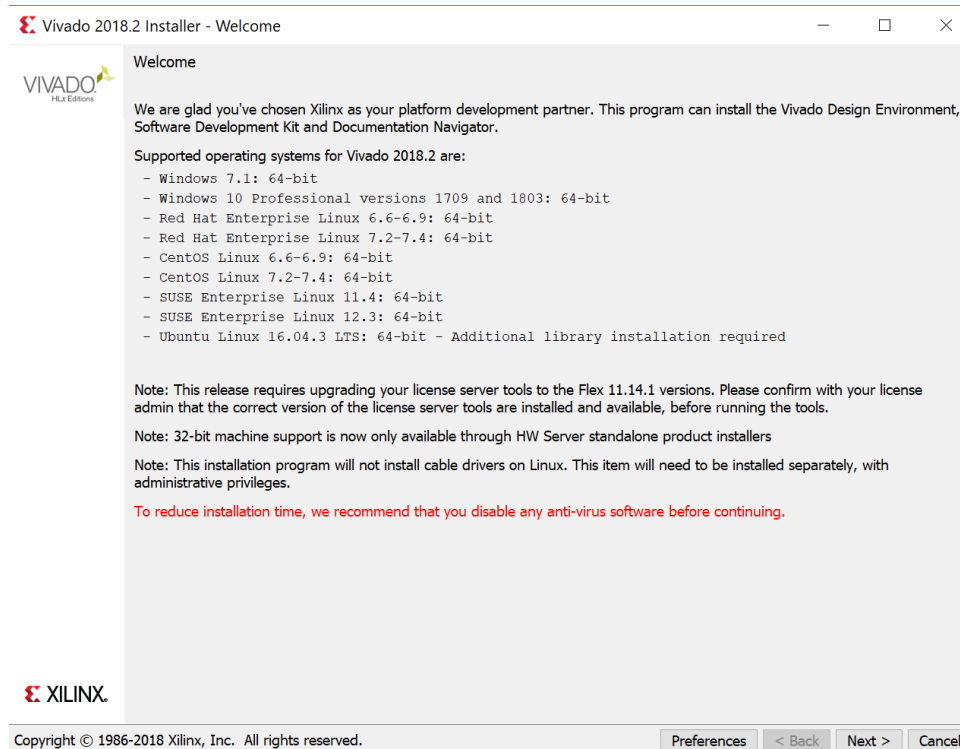
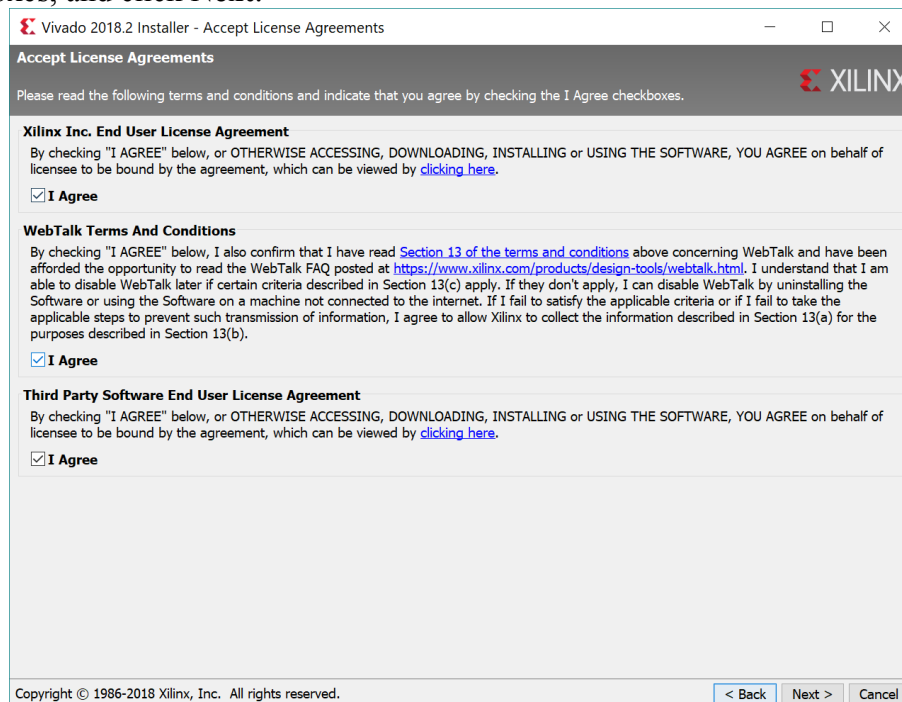
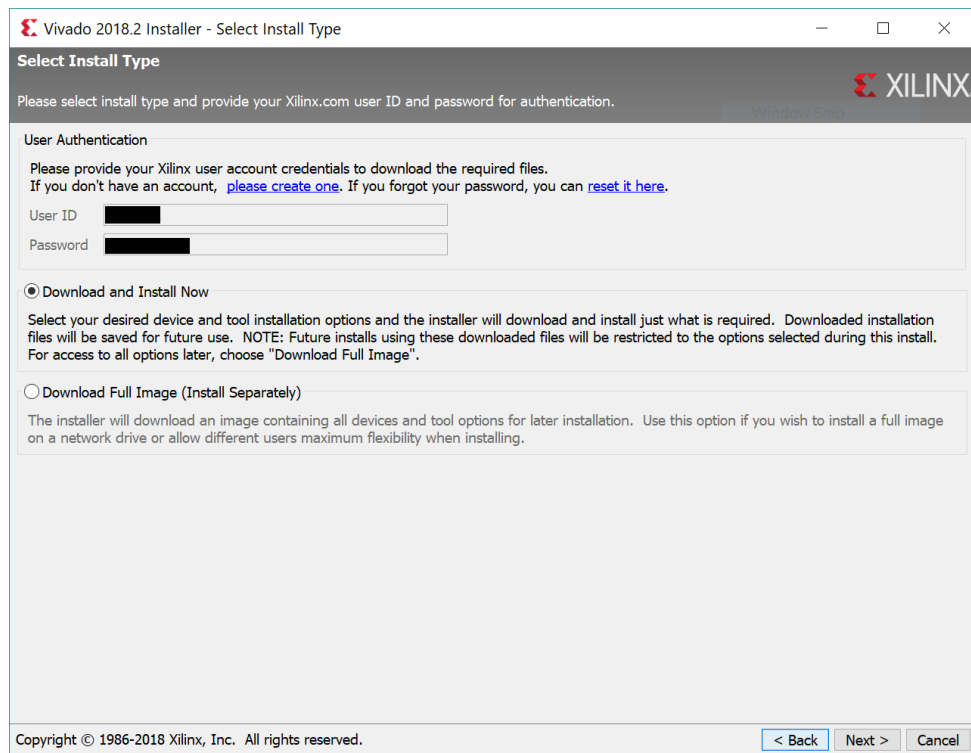


Figure 6. Xilinx Installer window

You will be prompted for your Xilinx user id and password created in Step 1. Enter them and click **Next**. Now you will see the Xilinx license agreement. Click on all of the **I Agree** boxes, and click **Next**.





Now select Vivado HL WebPACK Edition, as shown in Figure 7, and click Next.

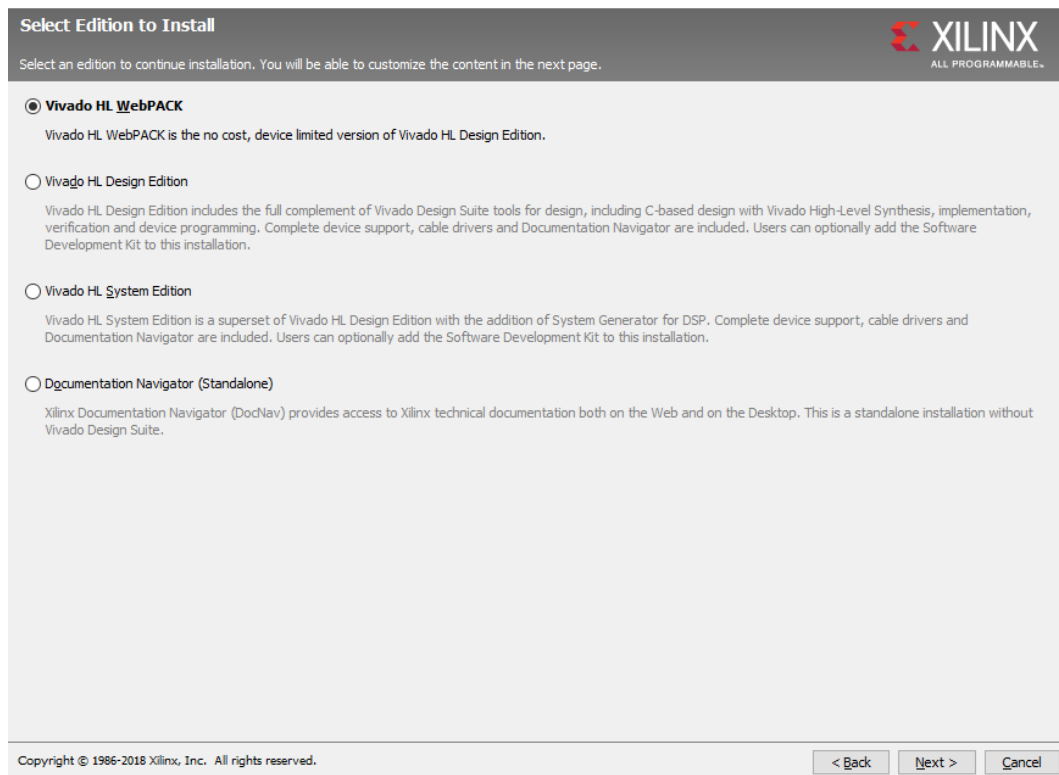


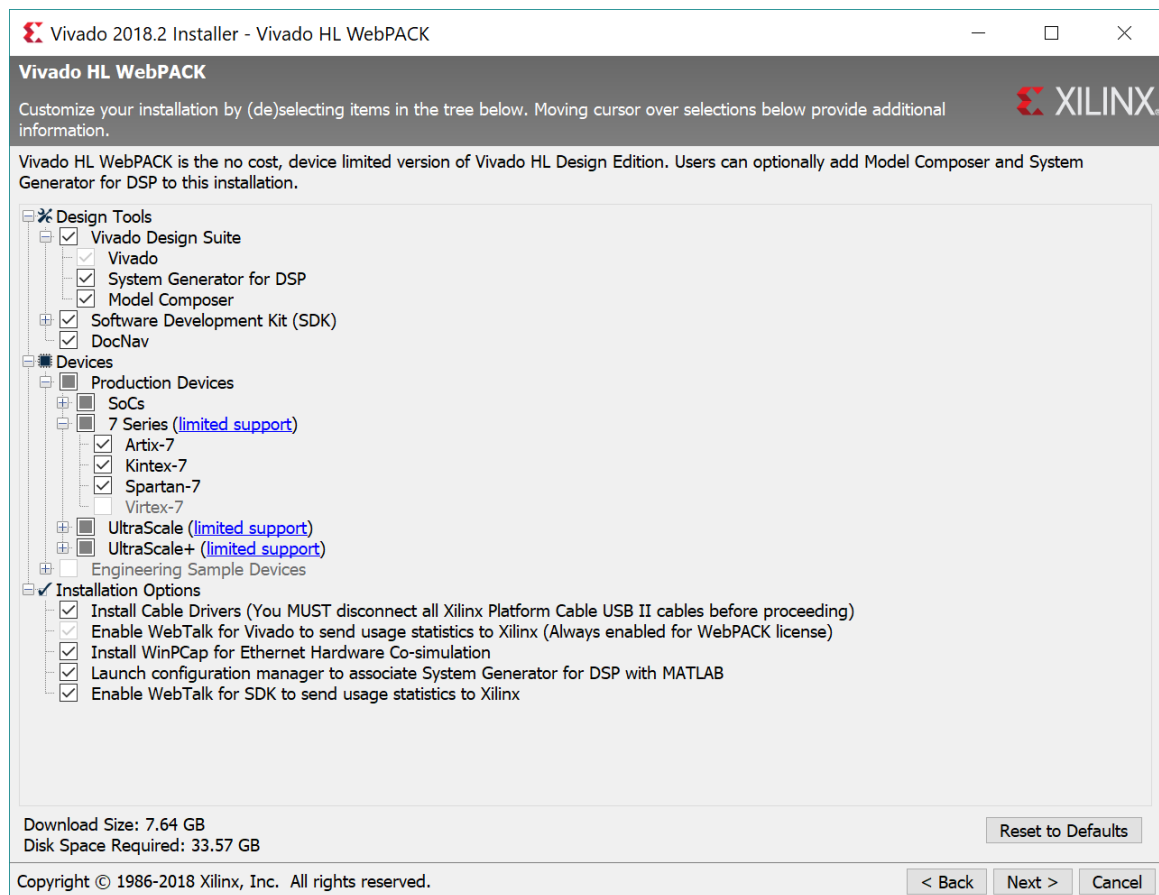
Figure 7. Choose Vivado WebPACK Edition

Now choose which Design tools and Devices to support. Make sure the following are selected:

- Design Tools → Vivado Design Suite
- Devices → 7 Series → Artix-7
- Installation Options → Install Cable Drivers and Acquire or Manage a License Key

NOTE: IF YOU ARE PLANNING TO TAKE ECE 544 ALSO SELECT THE SOFTWARE DEVELOPMENT KIT (SDK) OPTION. YOU WILL USE THE SDK IN ECE 544.

Artix-7 is the FPGA on the Nexys4 DDR board, so select at least that device. You should also install the Kintex library because many of the Vivado reference designs are implemented on a Kintex-based FPGA development platform. Feel free to add additional devices as desired.



Click Next.

Now select a destination directory (or accept the default), as shown in Figure 8, and click **Next**. You may be prompted to approve the creation of the installation directory (i.e., C:\Xilinx). If you choose a directory other than C:\Xilinx make sure the directory name does not have any spaces or special characters in it. Vivado has had problems with this in the past.

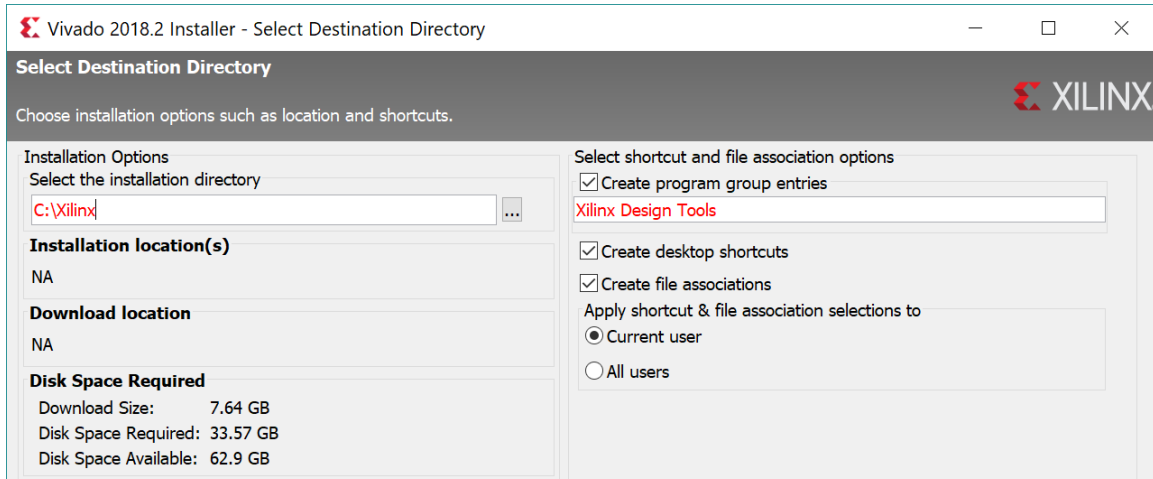


Figure 8. Xilinx Vivado destination directory

Now the Installation Summary window will appear, as shown in Figure 9. Click on Install.

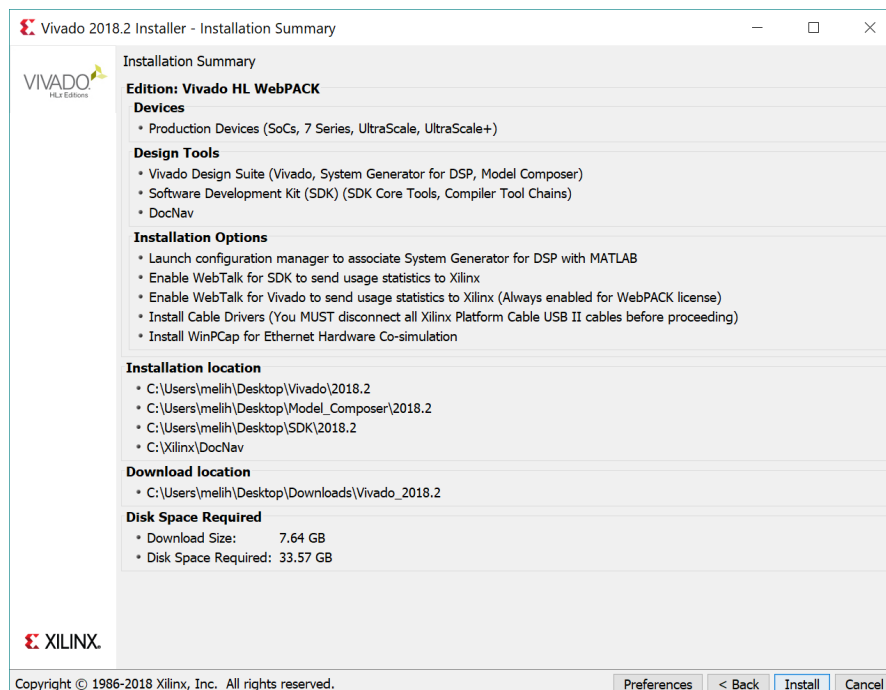


Figure 9. Installation Summary window

The installation Progress window will appear. Installation could take some time, depending on your internet and computer speed.

At the end of installation, the Vivado Installer will prompt you to unplug all Xilinx cables, as shown in Figure 10. Click **OK**.

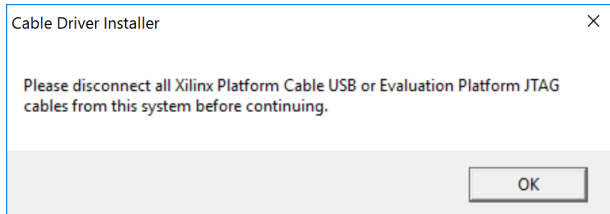


Figure 10. Cable Driver Installer window

If a window pops up asking if you want to install the device software, click **Install**.

After the cable drivers are installed, a window will pop up indicating that the installation was successful, as shown in Figure 11. Click **OK**.

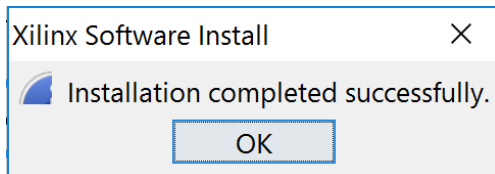


Figure 11. Installation successful window

2. Install OpenOCD and Codescape

This session describes how to install the programming tools for writing, compiling and downloading your C or assembly code onto MIPSfpga. You will install OpenOCD and Codescape MIPS SDK Essentials using a single installer.

When installing tools, be sure to **disable anti-virus** software.

Run (double-click on) OpenOCD-0.10.3-img-Installer-NoWeb.exe. A pop-up window will ask if you want to allow an unknown publisher to make changes to your computer. Click yes. A window will then open asking which programs to install, as shown in Figure 12. Leave both boxes checked so that you install both OpenOCD and Codescape MIPS SDK, and click Next.

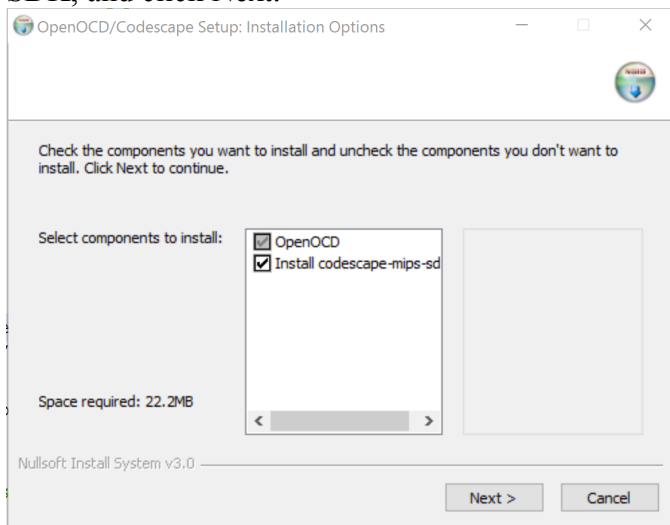


Figure 12. Installation options window

You will now be asked where you would like to install the files, as shown in Figure 13. Leave it as default (Note: that you should leave the install directory as the default to ensure the scripts provided with MIPSfpga work correctly), and click **Install**.

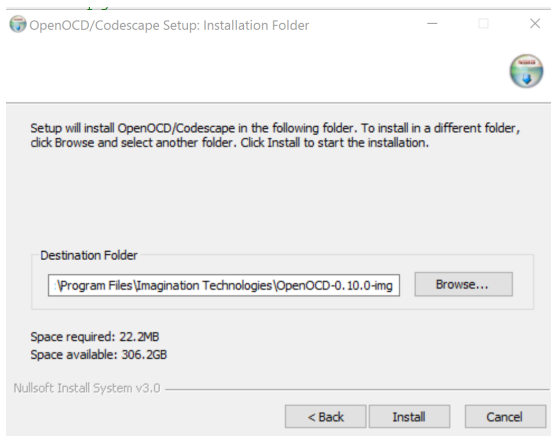


Figure 13. Installation Folder

A window will pop asking for confirmation to proceed with the installation of OpenOCD as shown in Figure 14. Click **Yes**.

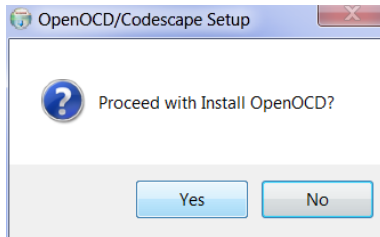


Figure 14. Confirm OpenOCD installation window

Installation of OpenOCD should take several seconds. After it has finished, the installer will say that the OpenOCD install is complete, click **OK**. The installer will then install Codescape MIPS SDK Essentials, after a short delay. Click **Next**, **Next**, then "**I accept the agreement**" and **Next**. Select Both Linux and Bare Metal Applications, as shown in Figure 15, and click **Next**.

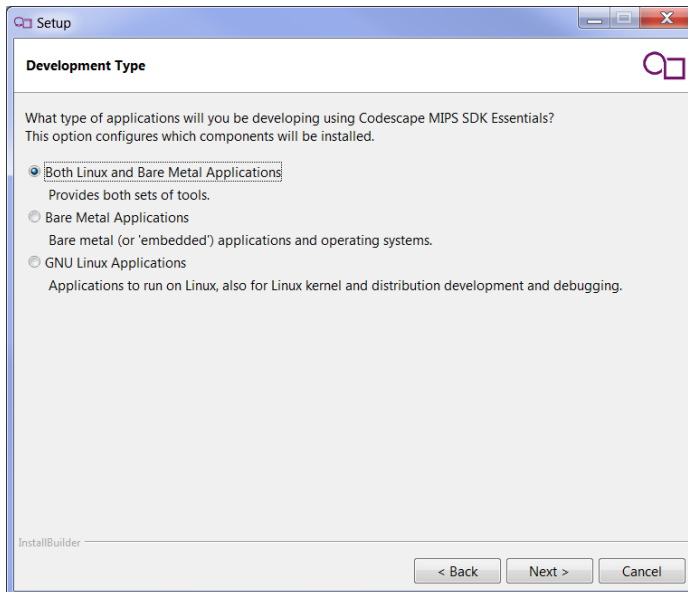


Figure 15. MIPS Toolchain Configurations

Now select MIPS Classic Legacy CPU IP Cores and MIPS Aptiv Family CPU IP Cores, as shown in Figure 16. Click **Next** and **Next**.

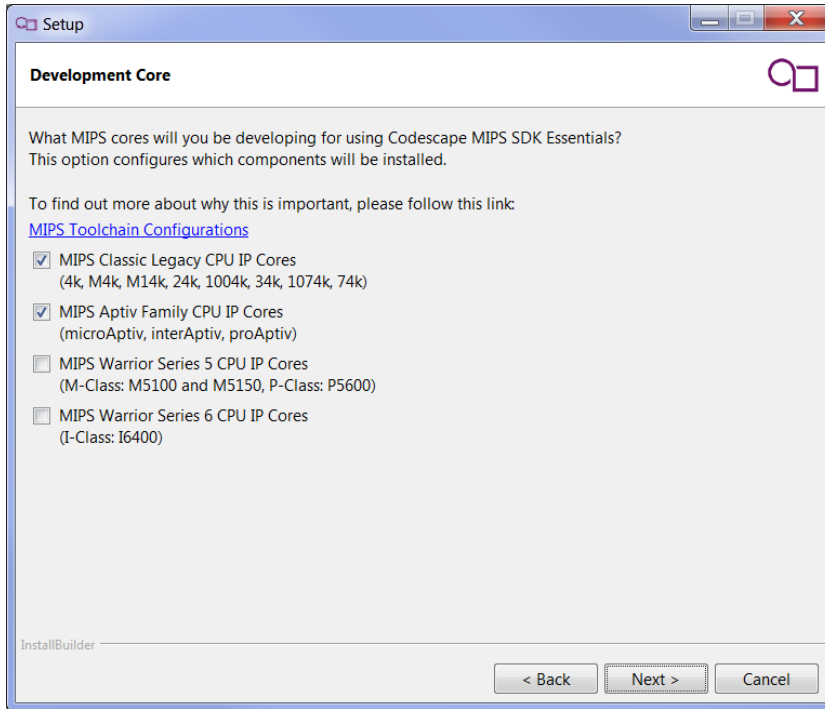


Figure 16. Development cores

Now the “Downloading required files” window shows up. If you need to use an HTTP Proxy, click the Use HTTP Proxy box and fill in the information. (If you don't know what this is, you probably don't need to use a proxy.) Click **Next**.

Codescape will be installed in the directory: C:\Program Files\Imagination Technologies.

After Codescape MIPS SDK installation is complete, a window will open with an option to Display Codescape's Getting Started guide. Click **Next**. A webpage will open with Codescape's Getting Started guide. You can view it if desired or simply close the window. OpenOCD and Codescape MIPS SDK Essentials installations are now complete. Close the OpenOCD/Codescape Installation window by clicking **Close**.

The OpenOCD online manual is available here for your reference:

<http://openocd.sourceforge.net/doc/html/index.html>

The OpenOCD User's Guide is the file **OpenOCD User's Guide.pdf**. This file was installed along with OpenOCD in folder C:\Program Files\Imagination Technologies\OpenOCD\openocd-0.9.2.

3. Install OpenOCD Bus Blaster Drivers

We are planning to use a MIPS Bus Blaster to connect a MIPSfpga target system to Codescape for Eclipse (C4E - the GUI-based MIPS software development IDE). MIPS Bus Blasters are available at the Nexys4 DDR-based workstations in the FAB Capstone Lab and WCC Lab. They are available for purchase from Digikey, Mouser, and Seeed Studios. See the syllabus for details.

Installing the Bus Blaster drivers is a two-step process. In this first step we install the OpenOCD drivers. Later on we will update the Bus Blaster drivers to the USB Serial driver used by C4E.

Make sure that you have installed the Codescape SDK and OpenOCD programming tools before you install the drivers and connect the Bus Blaster. The Bus Blaster is powered from a USB to mini-USB cable. Connect the Bus Blaster to your PC. The yellow power light (labeled PWR, as shown on the bottom left of Figure 17) should be lit, indicating that the Bus Blaster probe is connected to your computer.

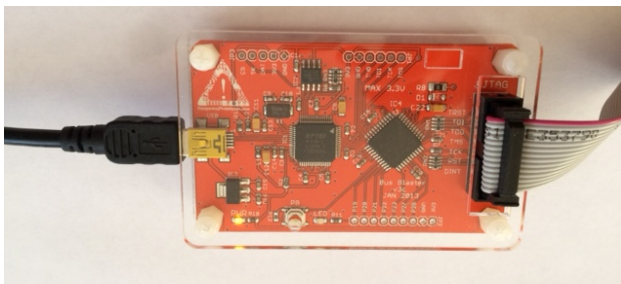


Figure 17. Bus Blaster probe

Browse to: **C:\Program Files\Imagination Technologies\OpenOCD-0.10-0-img**. Double-click on **zadig_2.1.1.exe**. You will be prompted if you want the Zadig program to make changes to your computer: click Yes. In the Zadig window that opens, click on **Options** → **List All Devices** from the File menu, as shown in Figure 18.

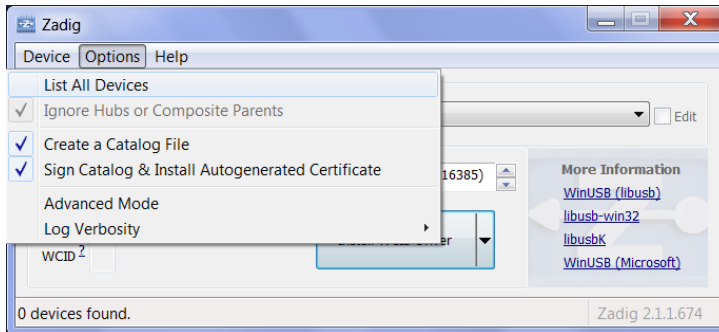


Figure 18. Zadig List All Devices

Highlight **BUSBLASTERv3c (Interface 0)** and click on **Install Driver** (or **Reinstall Driver** or **Replace Driver**), as shown in

Figure 19.

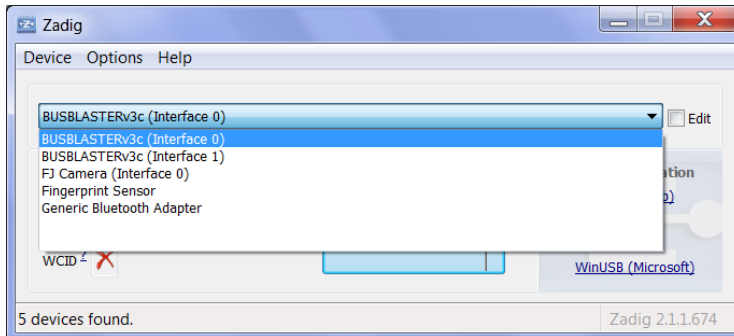


Figure 19. Install or reinstall Bus Blaster drivers

This process may take a few minutes. After the driver has finished installing, a window will pop up stating that "The driver was installed successfully". Click **Close**. Also install the driver for **BUSBLASTERv3c (Interface 1)**. When that completes, close the Zadig window.

4. Install Codescape for Eclipse (C4E)

Extract the following files:

Codescape-For-Eclipse-8.6.2.1504808942-x86_64.msi

Double-click on the .msi executable. Codescape-For-Eclipse installs under the Program Files\Imagination Technologies\Codescape-For-Eclipse-8.6 path.

5. Update Bus Blaster Drivers for C4E

NOTE : Windows 10 blocks “unsigned” drivers as a safety measure and these USB Serial drivers are not signed. This will cause the driver installation to fail. If this happens you will need to temporarily disable Digital Driver signing. To do so you should be able to follow the steps given in this link for Windows 10:

http://packard-bell-scandic.custhelp.com/app/answers/detail/a_id/38288/~/_windows-10%3A-disable-signed-driver-enforcement

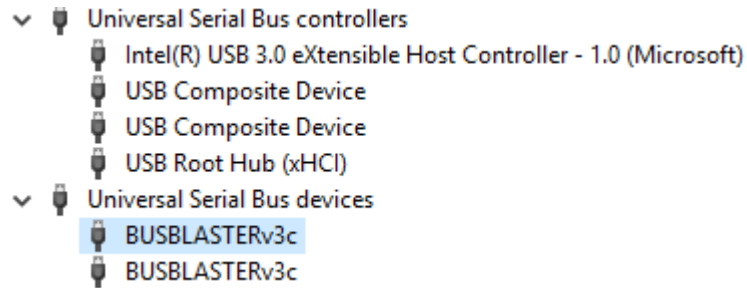
Then restart from the above steps. Digital Signing will be automatically enabled after your computer restarts.

Make sure your BusBlaster is plugged in at this point.

C4E does not use the same USB drivers for the Bus Blaster that OpenOCD does. At this point it is important to get the correct ones installed by following these steps.

1. Bring up Windows Device Manager (can be done by typing **Device** in the “Search programs and files” or in the Search Bar in the Windows 10 Task Bar. Select **Device Manager**. Go to the last item – Universal Serial Bus controllers in the Device Manager and expand it.
2. Plug in the Bus Blaster with its USB cable into the USB port you plan to use. You should be able to see something like that shown in step 3. Note, sometimes Interface0 is the second device.

3.



NOTE: If you do not see this, Go through the “INSTALL BUS BLASTER DRIVERS” in Section 3 and install (or reinstall) the OpenOCD drivers for the Bus Blaster.

4. Right click on the BUSBLASTERv3c (Interface 0), click **Update Driver Software...** then click on “**Browse my computer for driver software**”

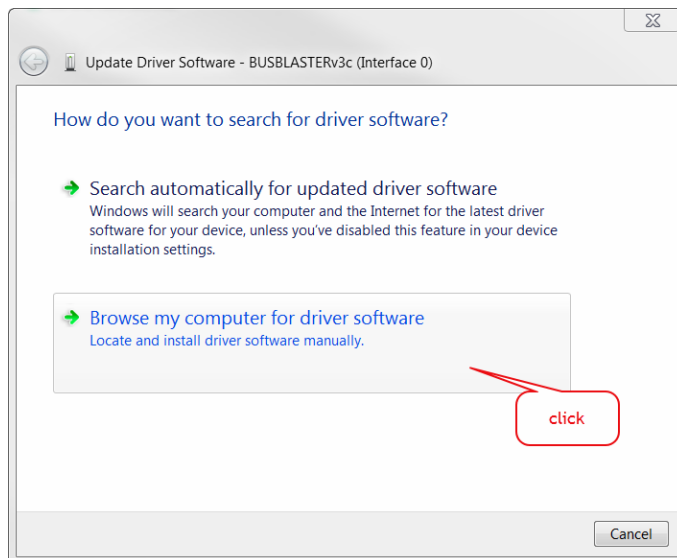


Figure 20. Install Bus Blaster drivers windows

Then click on “**Let me pick from a list of device drivers on my computer**”

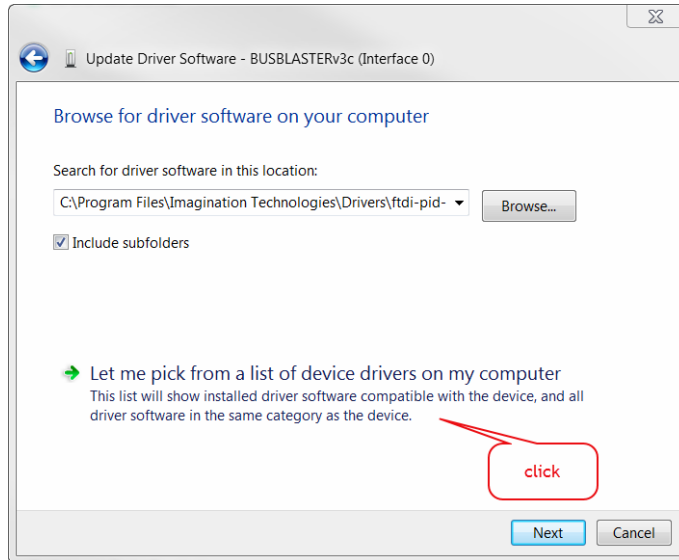


Figure 21. Install Bus Blaster drivers windows

Select “**BUSBLASTERv3c (Interface 1)**” and click on **Have Disk...**

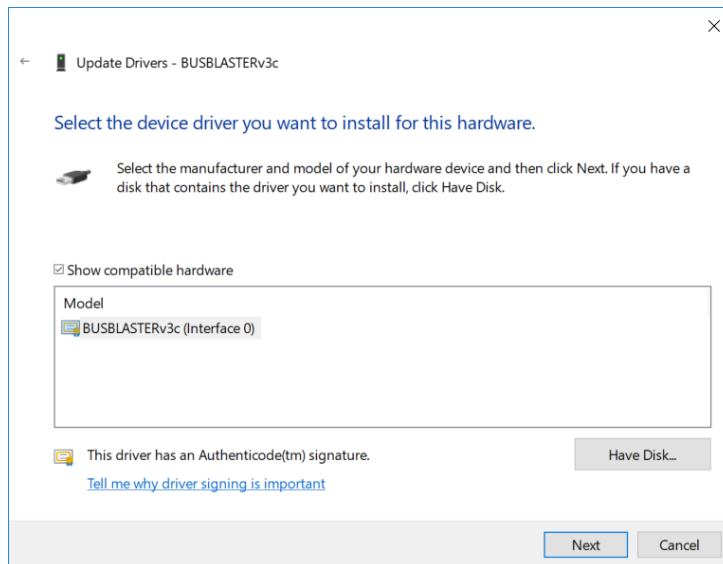


Figure 22.

Then “**Browse**” from the “**Install From Disk**”

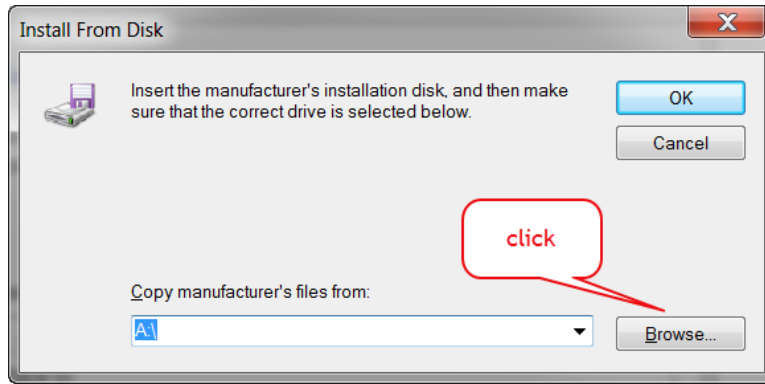


Figure 23.

Browse to the **ftdi-pid-7780-driver** as shown below, select **ftdibus.inf**, and click **Open**

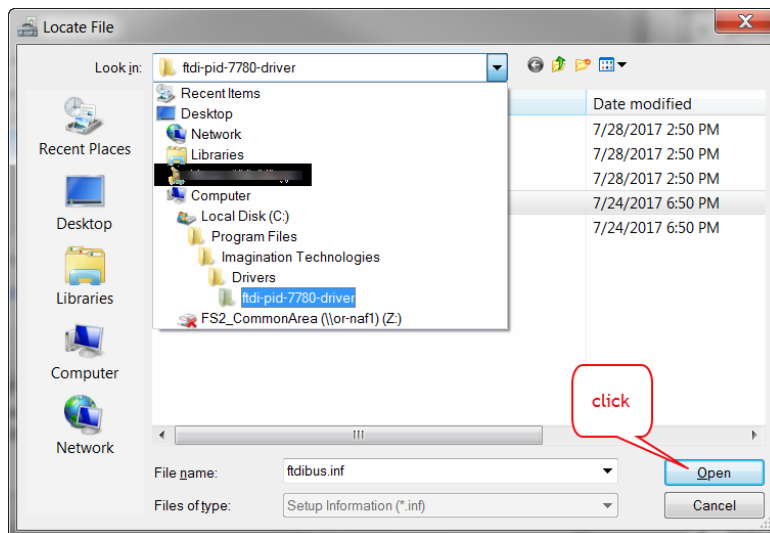


Figure 24.

Open the folder. It should look similar to this

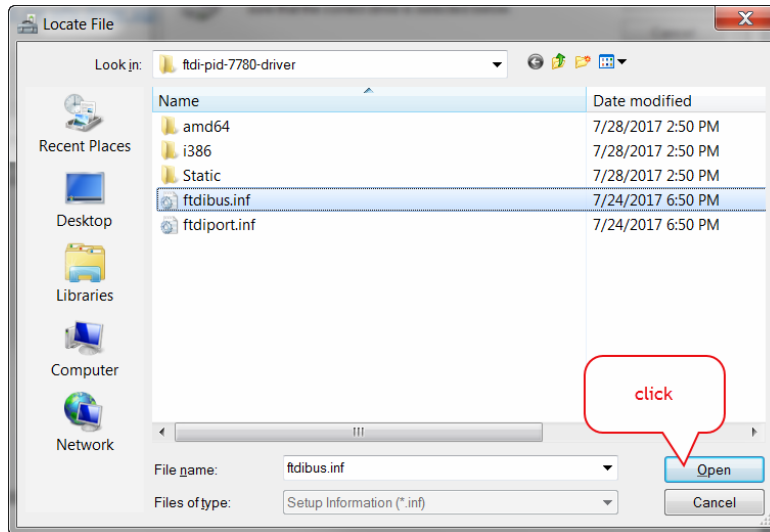


Figure 25.

After the driver is installed, go back to the Device Manager and apply the same change to the second BUSBLASTERv3c (Interface 1) to make it “**USB Serial Converter B**”.

You may be prompted to reboot your computer.

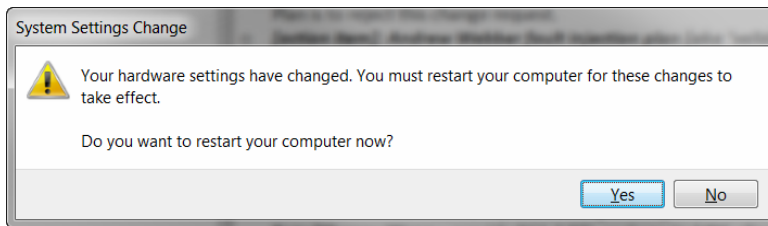


Figure 26.

Once both drivers are installed, you should see that they are now referred to as USB Serial Converter A and B, See Figure 28.

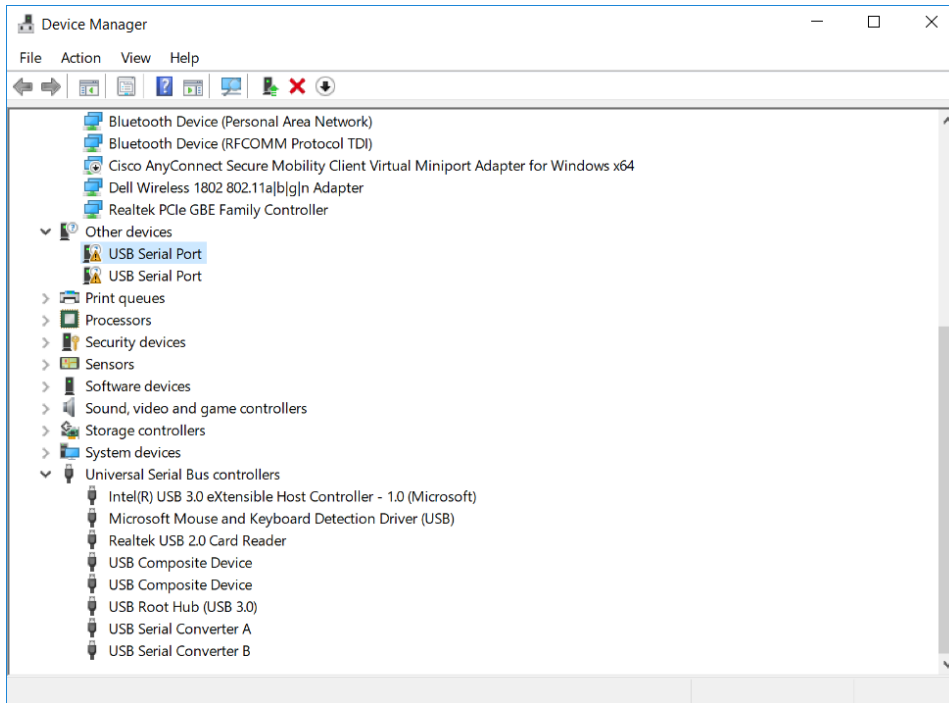


Figure 27.

As a point of reference, the USB Serial Converter A & B device drivers for the USB connection to the Nexys4 DDR have FTDI as the Manufacturer and the following Hardware IDs:

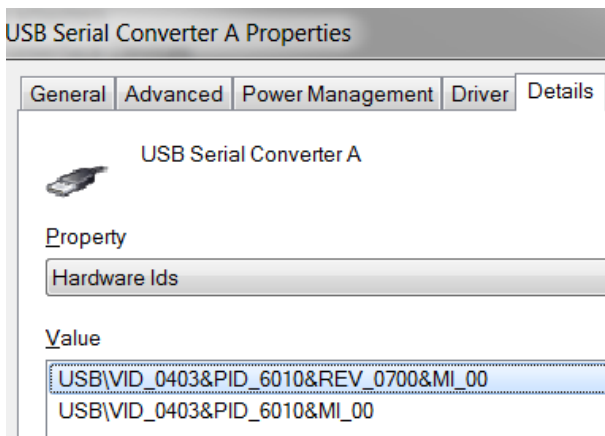


Figure 28.