

Getting Familiar with ZedBoard and Vivado Installation

Lecture 2

Outline

- ZedBoard Hardware Setup
 - Running a Linux application on the Processing System (PS) and interacting with the Programmable Logic (PL) cells
- Vivado Installation
- Programming the FPGA through JTAG
- Vivado Design Flows

Kit Content:

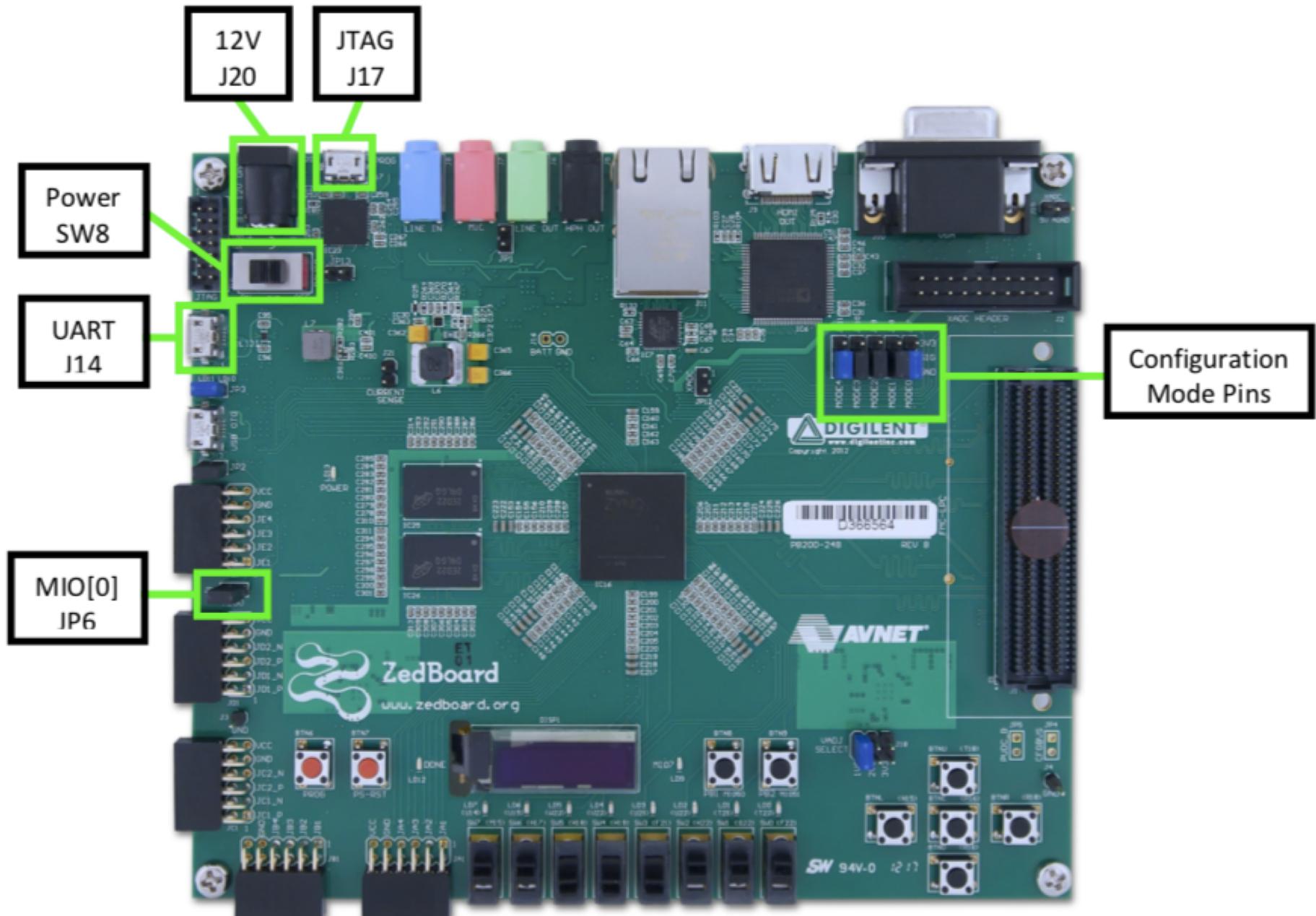
ZedBoard

12 volt / 5 ampere
power supply with US,
European AC adapter

USB-A to Micro-USB-B
cable

Micro-USB-B to Type A
Female adapter cable

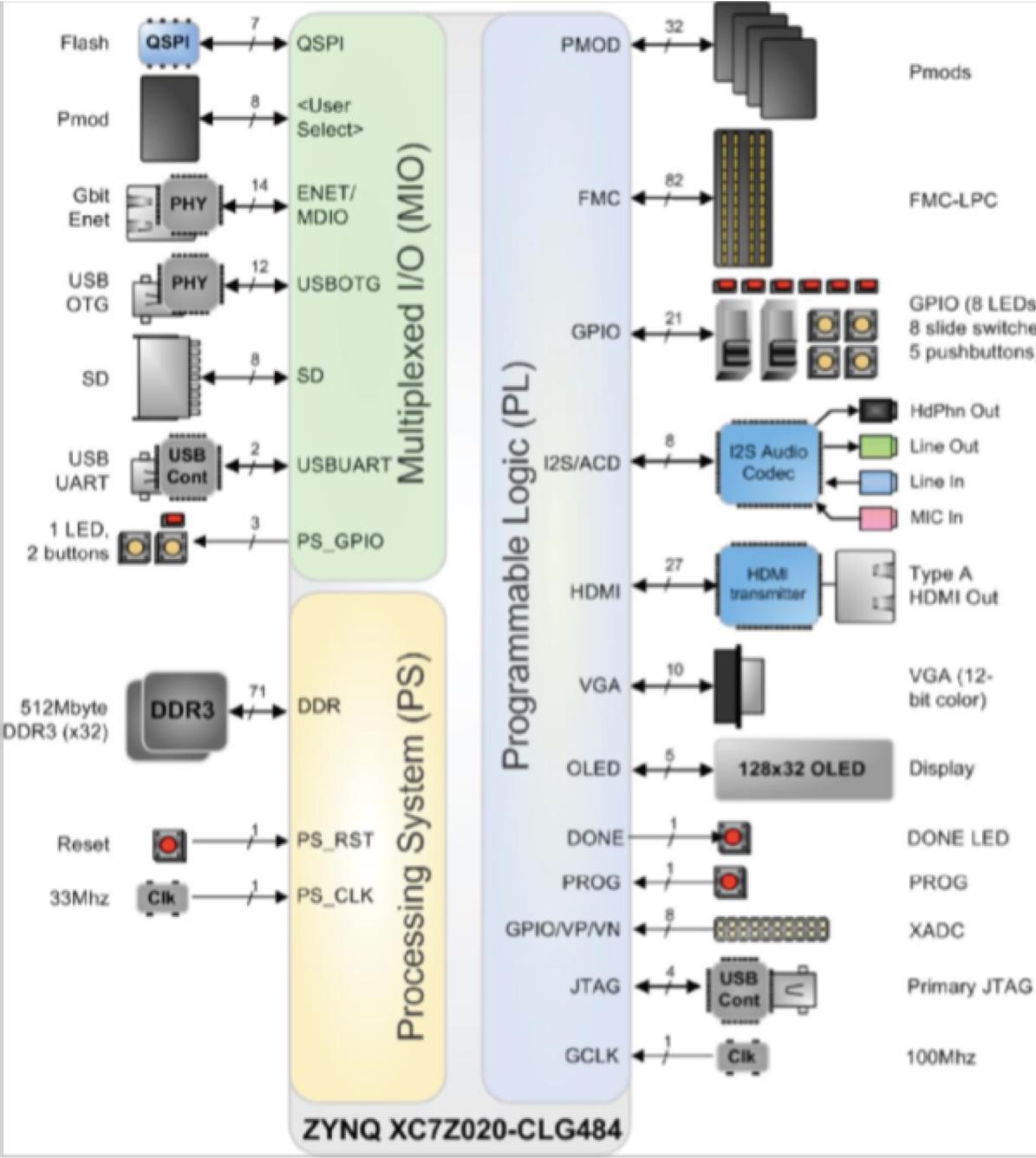
4GB SD card



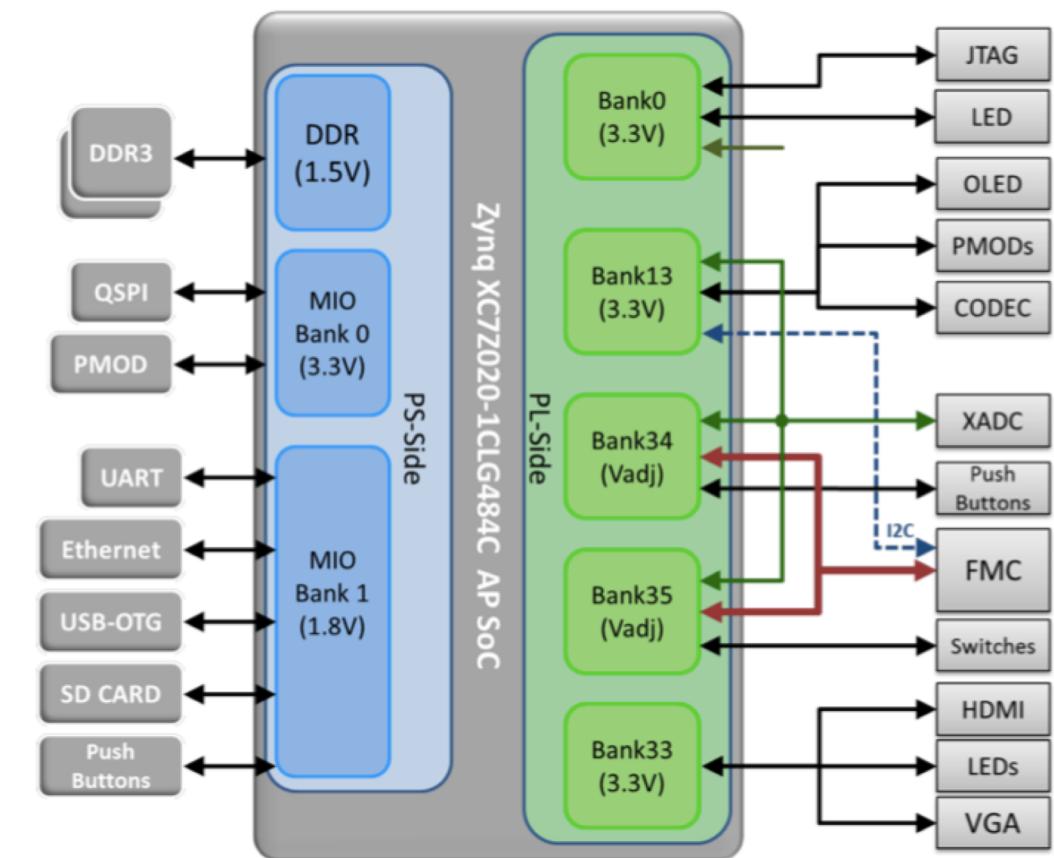
<http://zedboard.org/sites/default/files/documentation/GS-AES-Z7EV-7Z020-G-V7-1.pdf>

Configuration and Booting Guide http://islab.soe.uoguelph.ca/sareibi/TEACHING_dr/Xilinx_Boards_dr/ZedBoard_boot_guide_IDS14_1_v1_1.pdf

Hardware User Guide: http://www.zedboard.org/sites/default/files/ZedBoard_HW_UG_v1_3.pdf



Software running on the Processing System (PS) of Zynq-7000 AP SoC can interact with the Programmable Logic (PL) hardware to process inputs and outputs through the GPIO implemented in the programmable fabric.

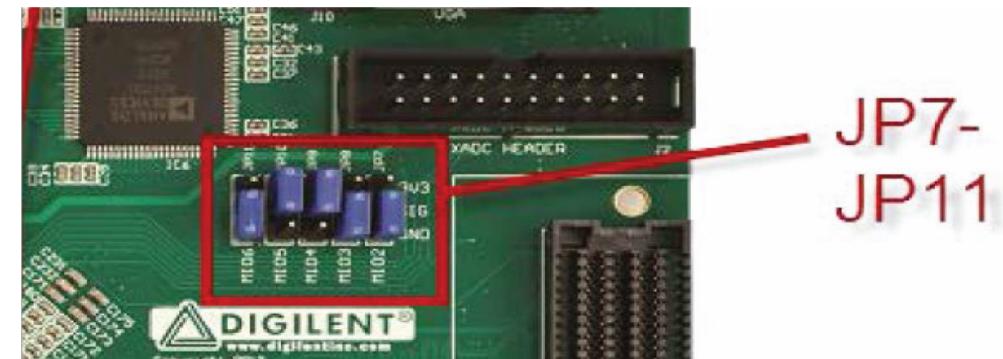


Zynq Z7020 CLG484 Bank Assignments

Verification of Communication with ZedBoard

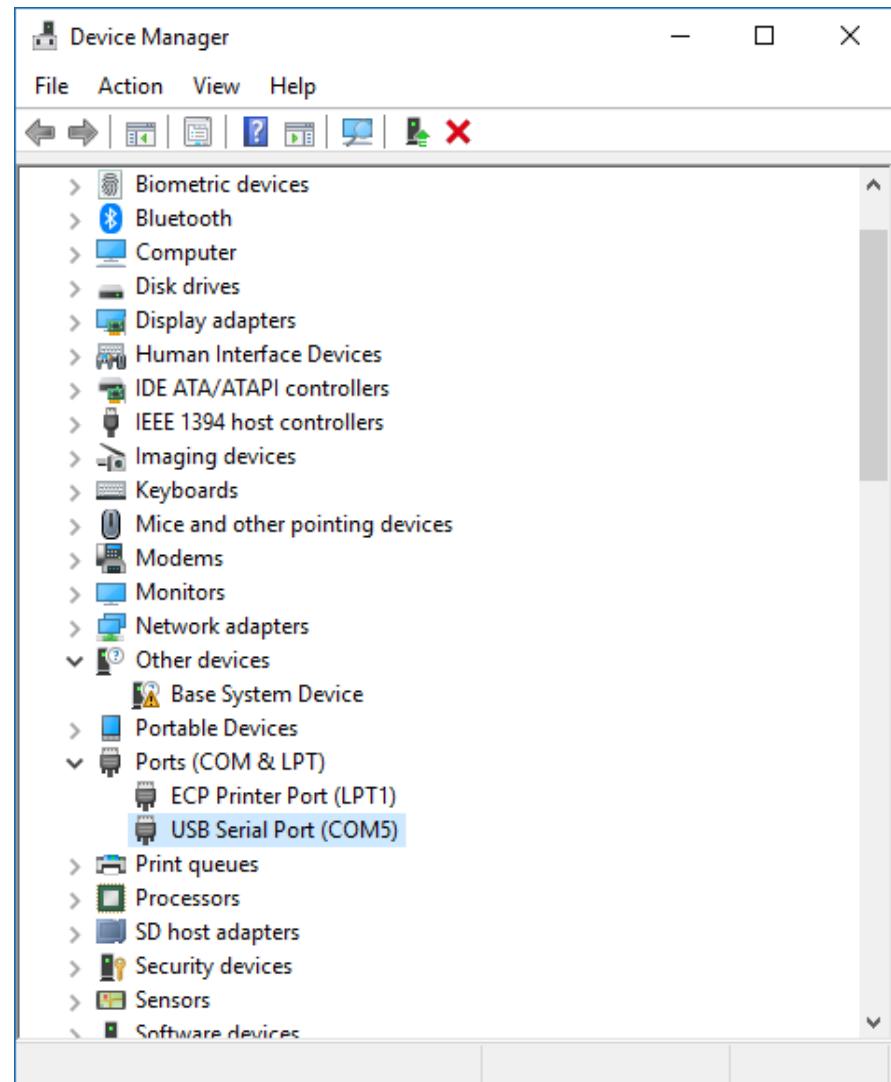
Interacting with GPIO Switches and LEDs

1. Connect 12 V power supply to barrel jack (J20).
2. Connect the USB-UART port of ZedBoard (J14) which is labeled **UART** to your machine using the MicroUSB cable.
3. Insert the 4GB SD card included with ZedBoard into the SD card slot (J12) located on the underside of ZedBoard PCB. This SD card comes preloaded with demo software and contains a basic Linux configuration used to implement the demos listed.
4. Verify the ZedBoard boot (JP7-JP11) are set are set as shown below.
5. Turn power switch (SW8) to the ON position. ZedBoard will power on and the Green Power Good LED (LD13) should illuminate.
6. Connect the USB cable to your machine. Wait about 15 seconds. The blue Done LED (LD12) should illuminate and a default image will be displayed on the OLED (DISP1).



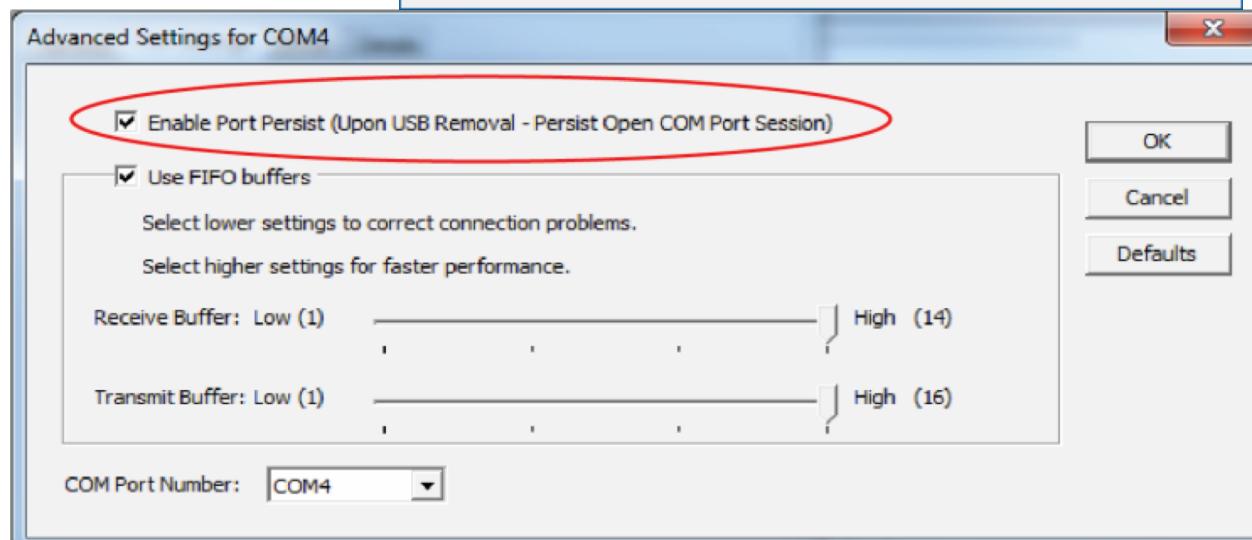
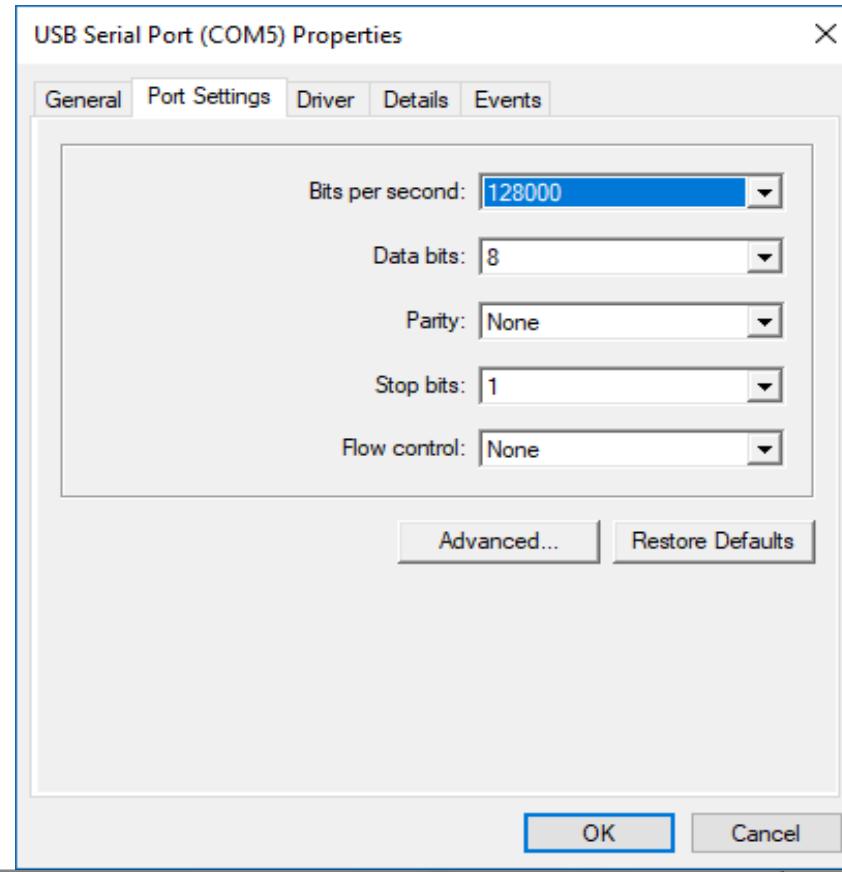
On Windows

1. The PC may pop-up a dialog box asking for driver installation. ZedBoard has a USB-UART bridge based on the Cypress CY7C64225 chipset. Use of this feature requires that a USB driver is installed on your Host PC. If the host PC does not recognize the USB-UART and enumerate it as a COM port device (see steps below) refer to the "[ZedBoard_USB-UART_Setup_Guide.pdf](#)" document for instructions on installing this driver. When driver installation is complete, continue to the next step.
2. Use Device Manager (press Windows key + R and type "devmgmt.msc") to determine the COM Port.

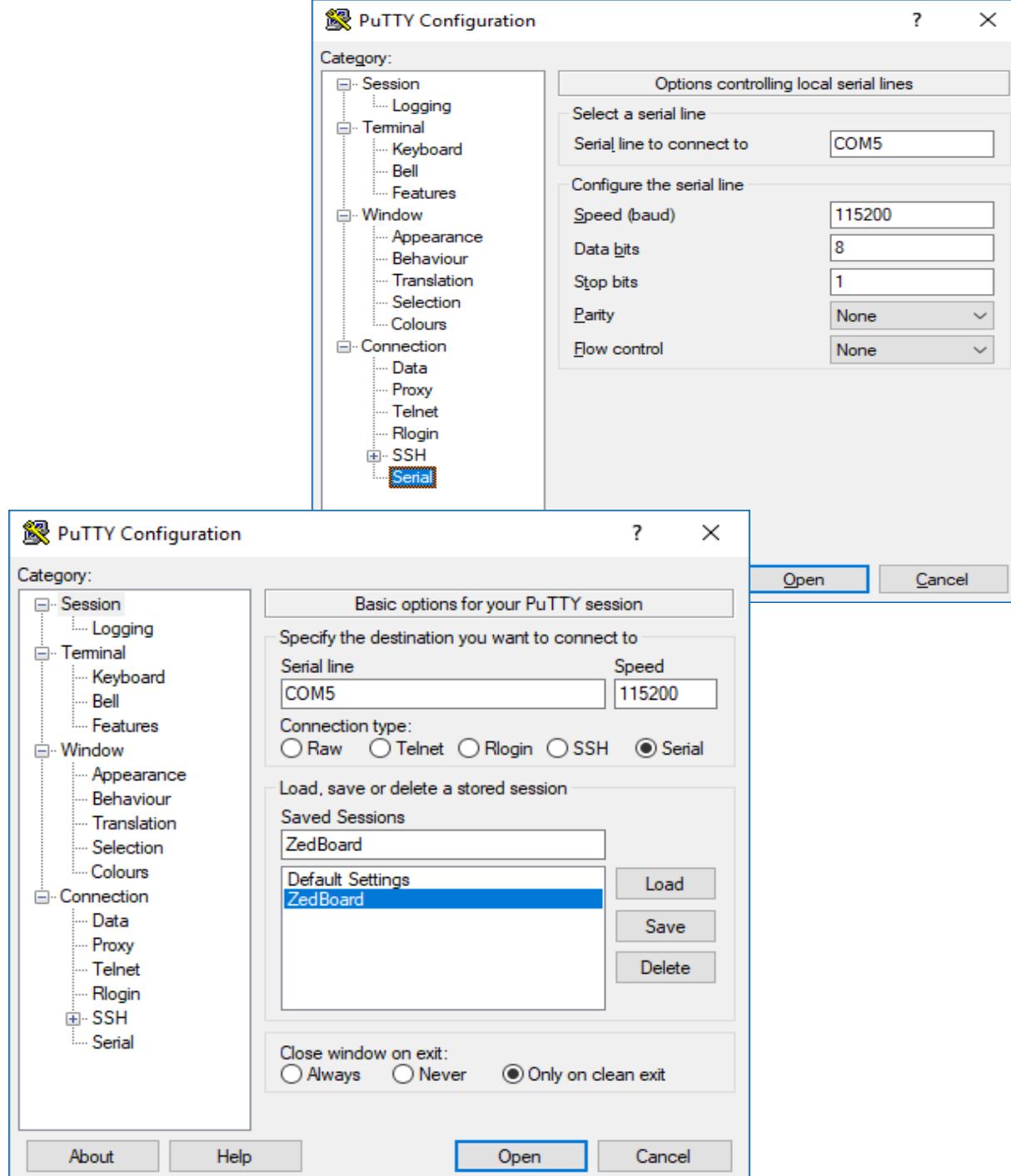


3. To enable ‘Port Persist’ mode double-click on the “USB Serial Port (COMx)” or “Cypress Serial (COMx)” port under “Ports (COM & LPT)” and adjust the settings in the “Port Setting” tab as shown below
4. Then click the “Advanced” button and check the “Enable Port Persist” check box (if such an option exists) in the Advanced Settings dialog box. Click OK to close the Advanced Settings dialog box and again to close the Serial Port Properties box.

5. Download and install [PuTTY](#).



6. Once installed, open Putty, navigate to “Connection -> Serial” and make the following settings (use the COM port shown in the Device Manager of Step 2 above; in our case we use COM5).
7. Go to “Session”, select Serial from the “Connection type”. Then, under “Saved Sessions”, type “ZedBoard” and click Save. You can now load the configuration at Putty’s startup by selecting “ZedBoard” from the list and then pressing “Load”.



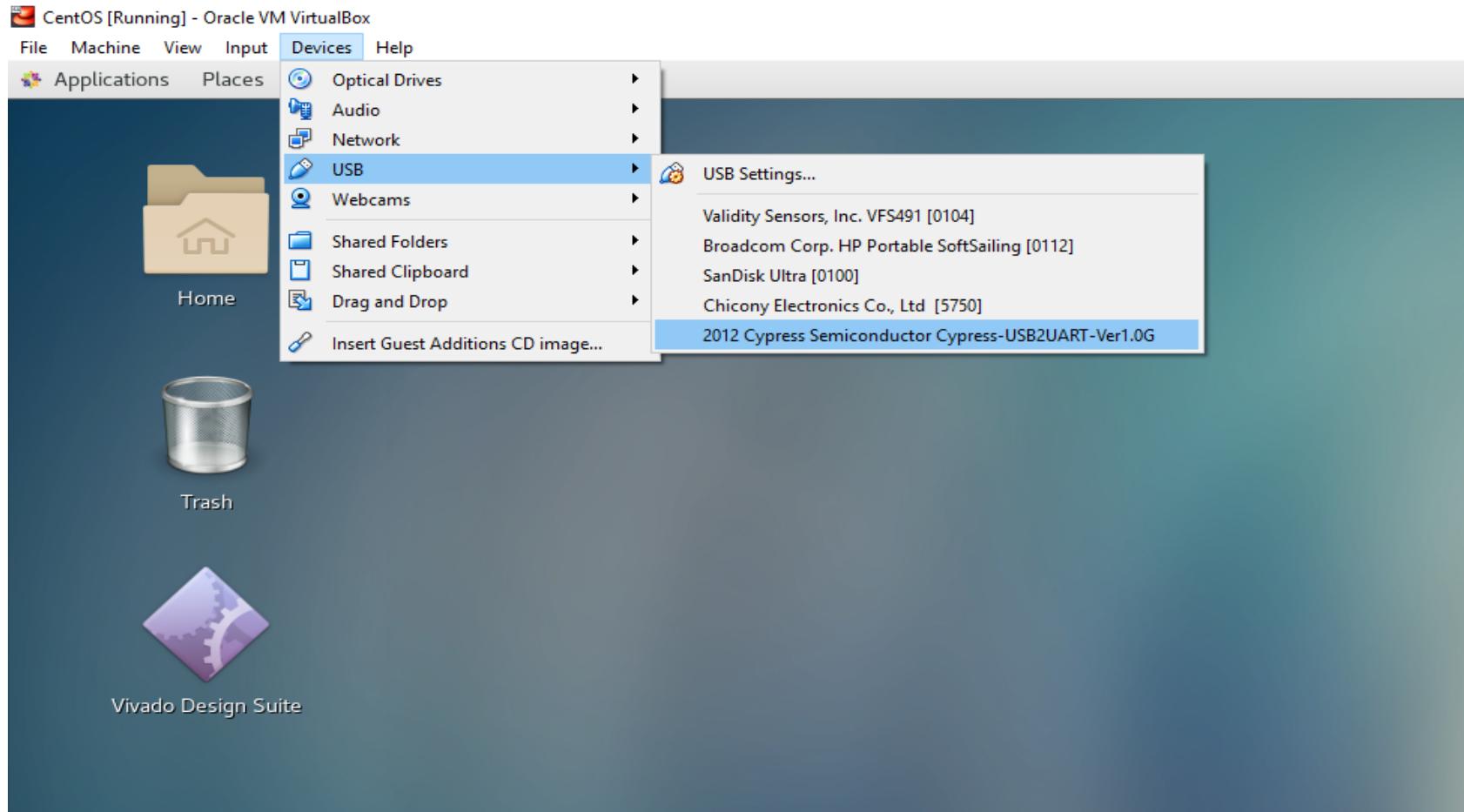
8. Click “Open”. At the new window that will show up hit “Enter” and you should see the following screen.
9. Type “`write_led 255`” and you should expect to see all LED to turn on. Similarly, if you type “`write_led 0`”, all of them will turn off.



The screenshot shows a PuTTY terminal window titled "COM5 - PuTTY". The window has a black background and white text. In the top left corner, there is a small icon of a computer monitor. The title bar also contains the text "COM5 - PuTTY". The main area of the window shows the command "zyng> write_led 255" followed by a green vertical bar. The window has standard operating system window controls (minimize, maximize, close) in the top right corner. A vertical scroll bar is visible on the right side of the terminal window.

On Linux

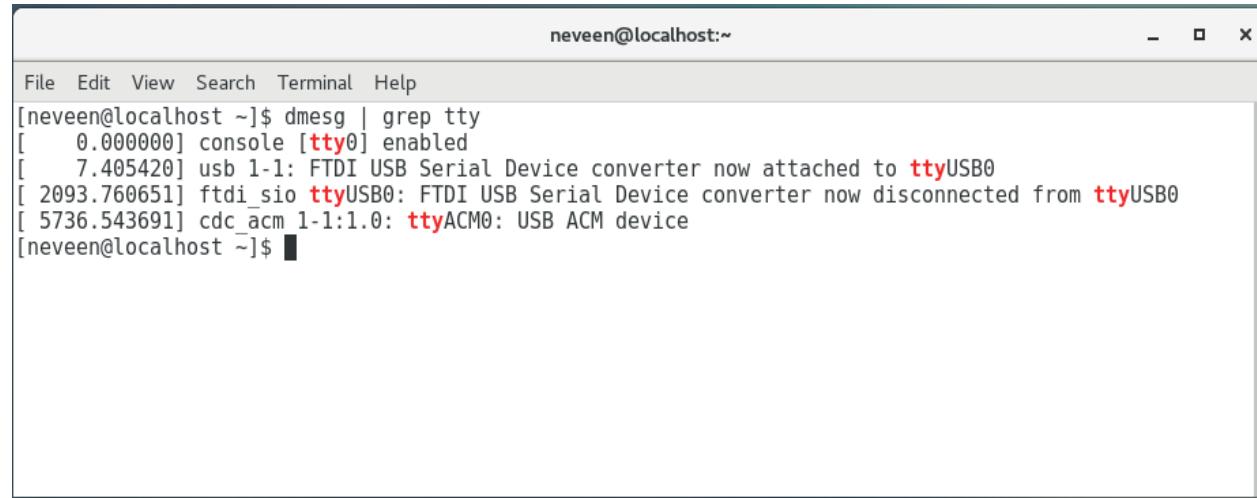
1. If a virtual machine is used, make sure that after connecting the ZedBoard to the computer, you connect the USB device to the virtual machine as shown below.



1. Open Terminal and type the command `dmesg | grep tty` to look for indication that the USB-UART is enumerated as a device. In the screenshot below, the Linux host has enumerated the ZedBoard USB-UART as the `/dev/ttyACM0` device.

2. Execute the command `sudo yum install minicom` (CentOS, apt for ubuntu) to install the tool “minicom”.

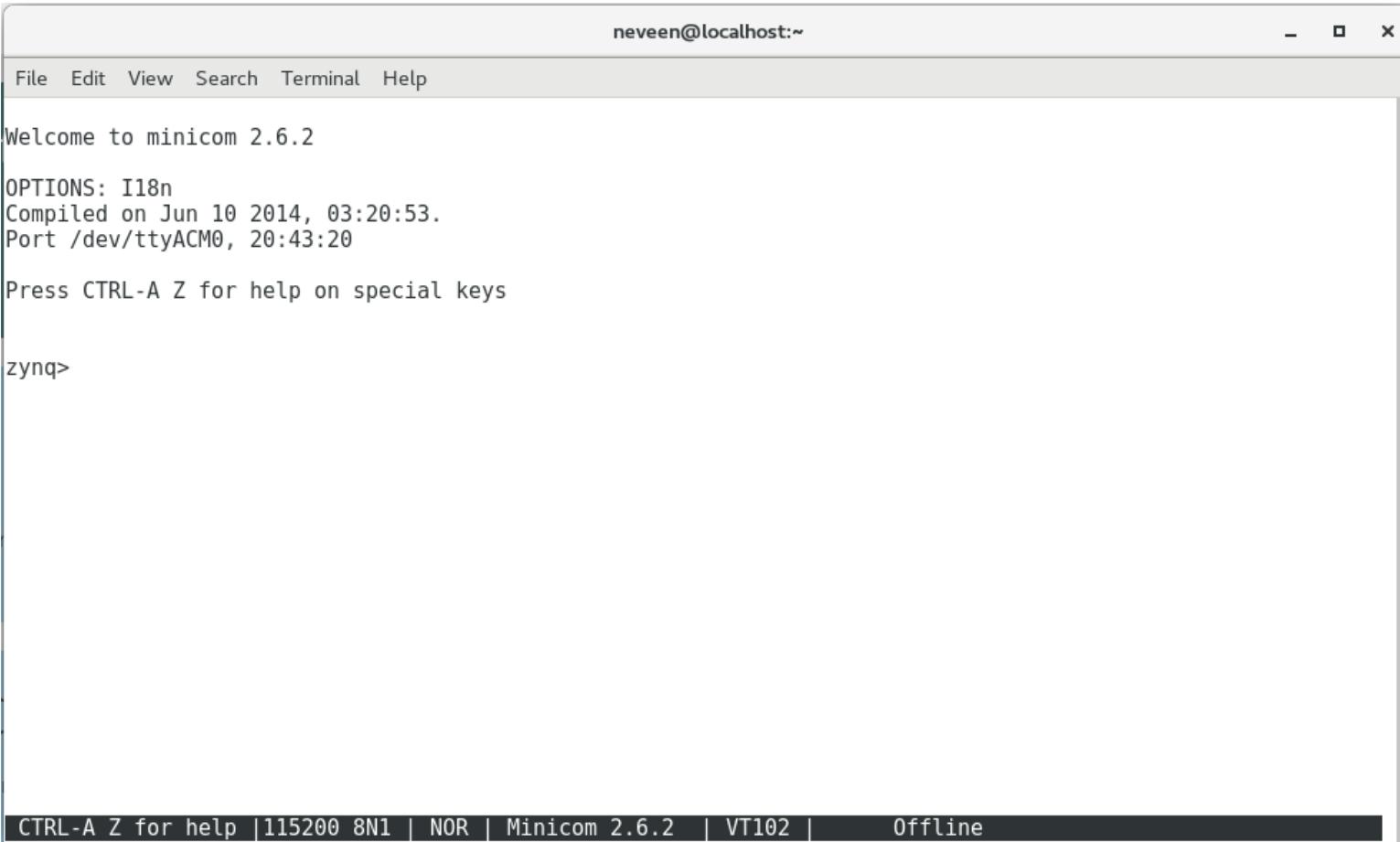
3. After installing the minicom tool, type `sudo minicom -D /dev/ttyACM0 -b 115200 -o`



A screenshot of a terminal window titled "neveen@localhost:~". The window shows the output of the command `dmesg | grep tty`. The output indicates the enumeration of a USB-UART device:

```
[neveen@localhost ~]$ dmesg | grep tty
[    0.000000] console [tty0] enabled
[    7.405420] usb 1-1: FTDI USB Serial Device converter now attached to ttyUSB0
[   2093.760651] ftdi_sio ttyUSB0: FTDI USB Serial Device converter now disconnected from ttyUSB0
[  5736.543691] cdc_acm 1-1:1.0: ttyACM0: USB ACM device
[neveen@localhost ~]$
```

4. Press “Enter” on the next screen and you will see the following:



The screenshot shows a terminal window titled "neveen@localhost:~". The window has a menu bar with "File", "Edit", "View", "Search", "Terminal", and "Help". The main area displays the following text:
Welcome to minicom 2.6.2
OPTIONS: I18n
Compiled on Jun 10 2014, 03:20:53.
Port /dev/ttyACM0, 20:43:20
Press CTRL-A Z for help on special keys

zyinq>

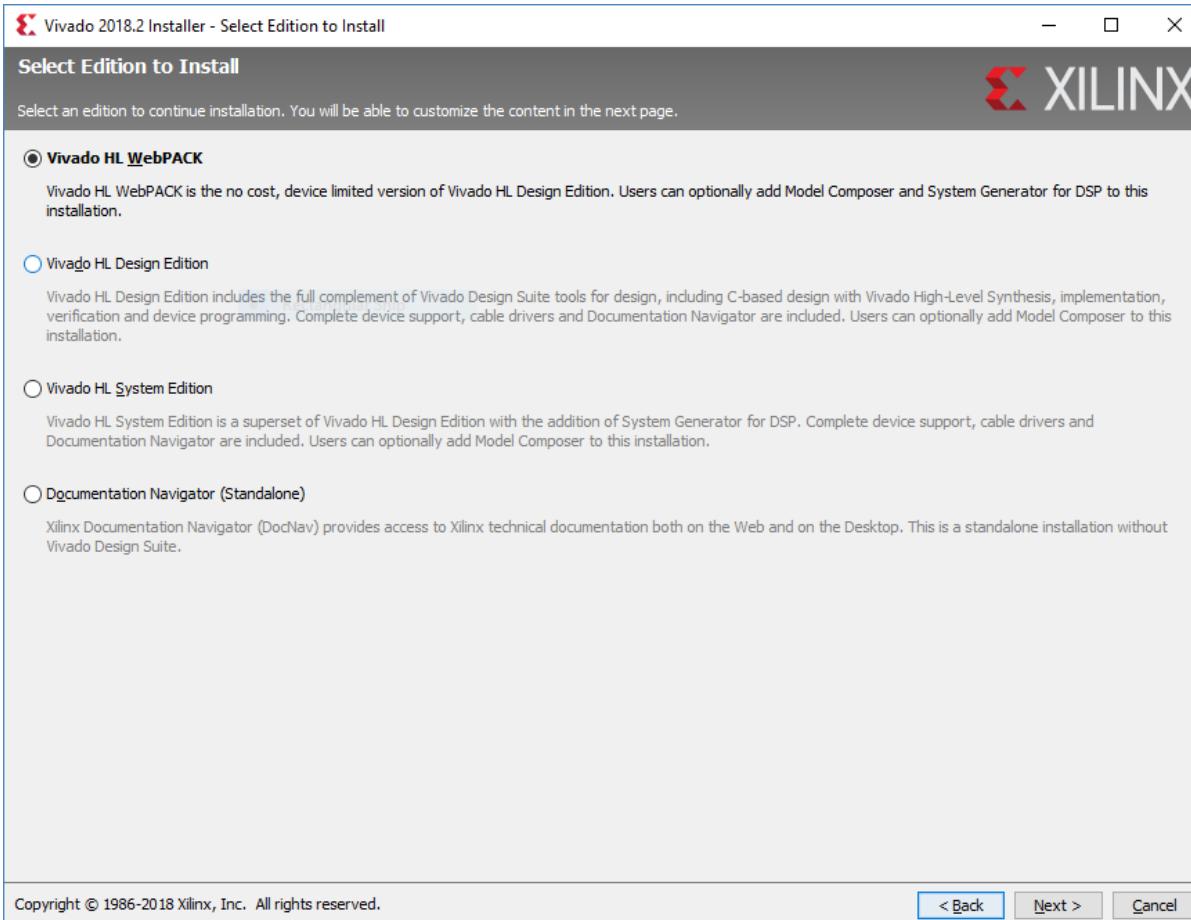
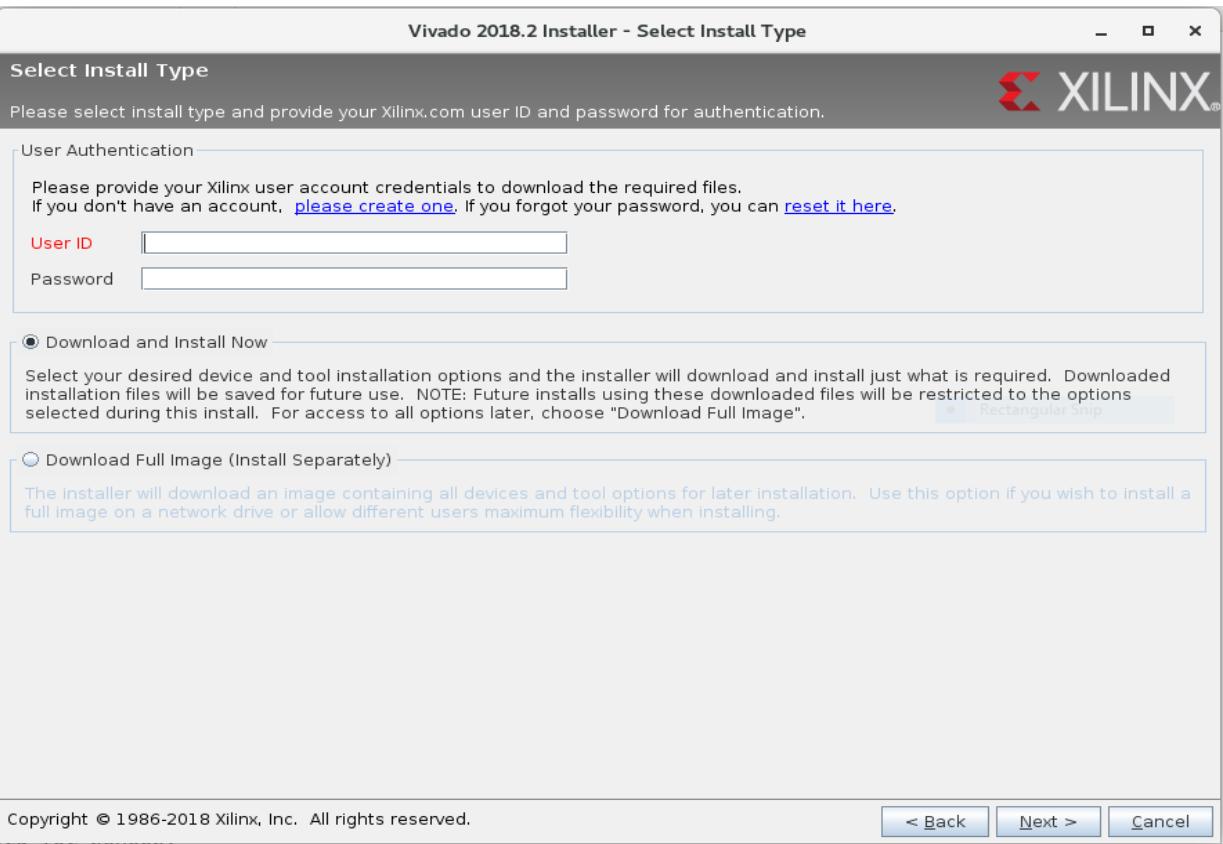
At the bottom of the window, there is a status bar with the following information: "CTRL-A Z for help | 115200 8N1 | NOR | Minicom 2.6.2 | VT102 | Offline".

5. Type “`write_led 255`” and you should expect to see all LED to turn on. Similarly, if you type “`write_led 0`”, all of them will turn off. Also try “`read_sw`”.
6. [More Demos](#)

Installation of Xilinx Vivado HL WebPack

1. Create a Xilinx account: <https://www.xilinx.com/registration/create-account.html>
2. Download the *Vivado Design Suite - HLx Editions*:
 - For Windows:
https://www.xilinx.com/member/forms/download/xef.html?filename=Xilinx_Vivado_SDK_Web_2018.2_0614_1954_Win64.exe
 - For Linux:
https://www.xilinx.com/member/forms/download/xef.html?filename=Xilinx_Vivado_SDK_Web_2018.2_0614_1954_Lin64.bin
3. On Windows, double-click the downloaded executable file and proceed to the next step. On Linux, open the Terminal and navigate to the directory where you saved the “bin” file (typically ~/Downloads). Execute the following commands:
 - `sudo chmod +x Xilinx_Vivado_SDK_Web_2018.2_0614_1954_Lin64.bin`
 - `sudo ./Xilinx_Vivado_SDK_Web_2018.2_0614_1954_Lin64.bin`

4. Enter your Xilinx account credentials and select “Download and Install Now”.



5. For the Edition to install, select “Vivado HL WebPACK” (the Design Edition requires paid license).

6. Make the following installation customization selections:
7. After installation, to open the software on **Windows** simply double-click the Desktop icon (Vivado 2018.2). On **Linux**, you can type the command in the Terminal

/opt/Xilinx/Vivado/2018.2/bin/vivado
or create a shortcut on the desktop, as follows:

- In the Terminal, type:
nano ~/Desktop/vivado.desktop
- Copy the following:

[Desktop Entry]

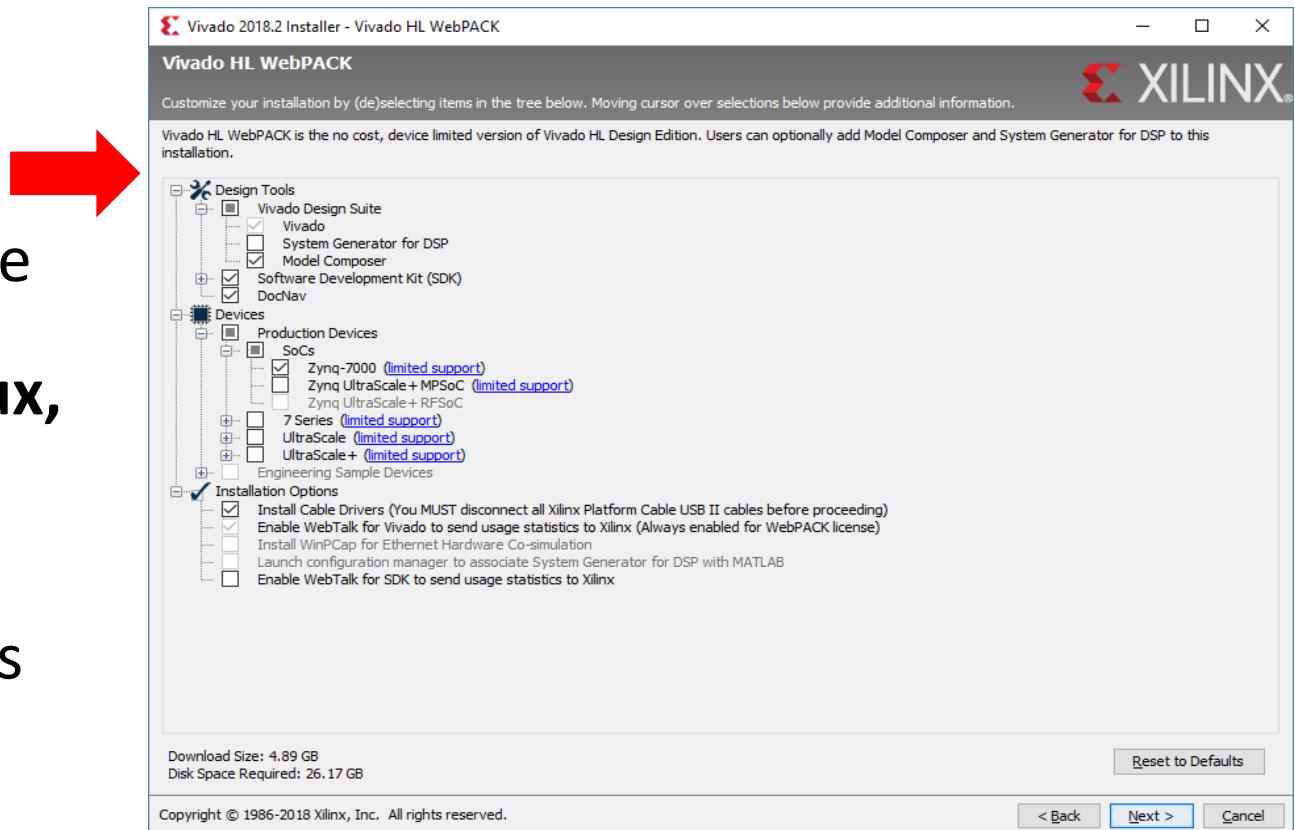
Version=1.0

Name[en_US]=Vivado Design Suite

Exec=/opt/Xilinx/Vivado/2018.2/bin/vivado

Terminal=false

Type=Application

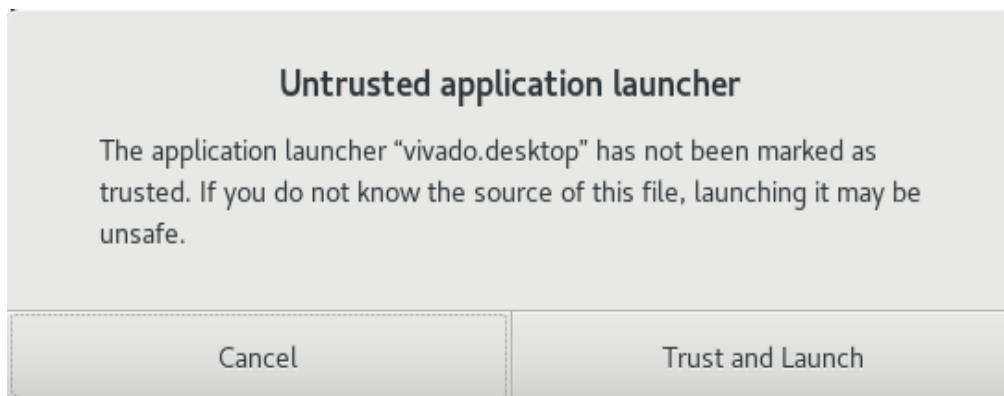


The screenshot shows a terminal window titled 'GNU nano 2.3.1' with the file '/home/neveen/Desktop/vivado.desktop' open. The file contains the following desktop entry information:

```
[Desktop Entry]
Version=1.0
Name[en_US]=Vivado Design Suite
Exec=/opt/Xilinx/Vivado/2018.2/bin/vivado
Terminal=false
Type=Application
```

The terminal window also displays a set of keyboard shortcuts at the bottom.

- Press “**Ctrl + X**”, the “**Y**” to save the file, and finally “**Enter**” (see screenshots below).
- A new file, named “**vivado.desktop**”, will be created in the desktop. By double-clicking on it, an “**untrusted application launder**” pop-up will be shown (see below), click “**Trust and Launch**”. The Vivado Design Suite will now start.



```

File Edit View Search Terminal Help
GNU nano 2.3.1 File: /home/neveen/Desktop/vivado.desktop Modified

[Desktop Entry]
Version=1.0
Name[en_US]=Vivado Design Suite
Exec=/opt/Xilinx/Vivado/2018.2/bin/vivado
Terminal=false
Type=Application

Save modified buffer (ANSWERING "No" WILL DESTROY CHANGES) ?
 Y Yes
 N No  C Cancel

```

```

File Edit View Search Terminal Help
GNU nano 2.3.1 File: /home/neveen/Desktop/vivado.desktop Modified

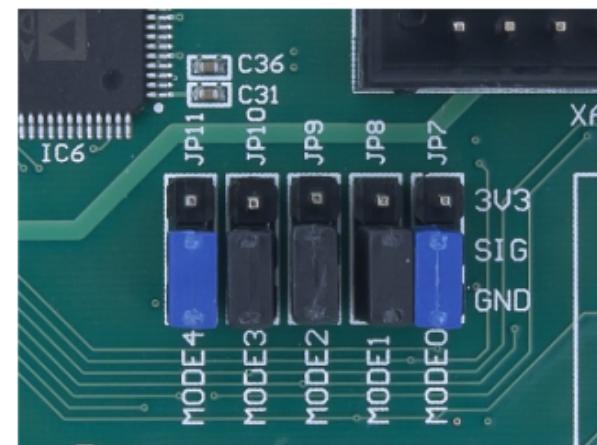
[Desktop Entry]
Version=1.0
Name[en_US]=Vivado Design Suite
Exec=/opt/Xilinx/Vivado/2018.2/bin/vivado
Terminal=false
Type=Application

File Name to Write: /home/neveen/Desktop/vivado.desktop
^G Get Help M-D DOS Format M-A Append M-B Backup File
^C Cancel M-M Mac Format M-P Prepend

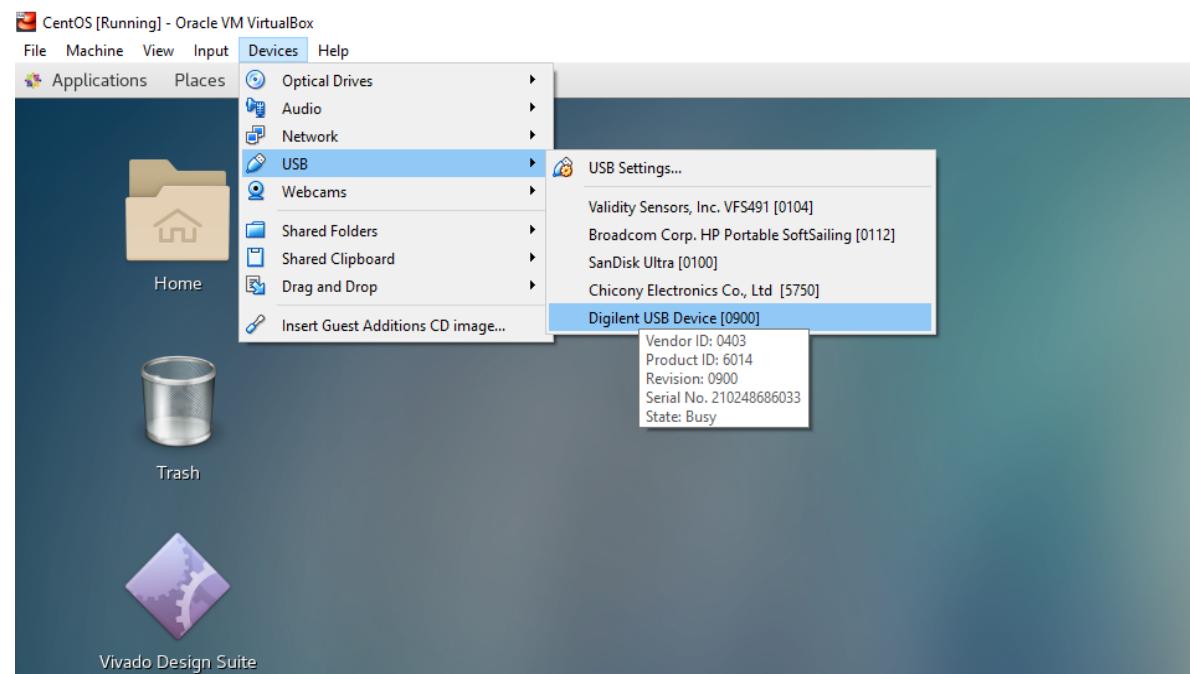
```

Programming the FPGA through JTAG

1. Verify the ZedBoard is powered off and set the configuration Mode jumpers to the JTAG mode (all pins shunted to GND) as in the figure.
2. Connect the MicroUSB cable to the J17 (PROG) port (located next to the J20 power supply port).
3. Power on the ZedBoard. The board is ready for connection with the Xilinx Vivado Design Suite.



Note: If using a virtual machine, the USB connection must be selected, as below, from the VirtualBox Devices settings (the device will be named differently).



- To verify the connection, open Vivado Design Suite and click “Open Hardware Manager” under the “Tasks” category.
- Click “Open Target” and select “Auto Connect”.
- If the connection is successful (auto-connection may fail the first time; try again Step 5), you will see the following screen.

