# 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
- Programing the FPGA through JTAG
- Vivado Design Flows

# Kit Content:

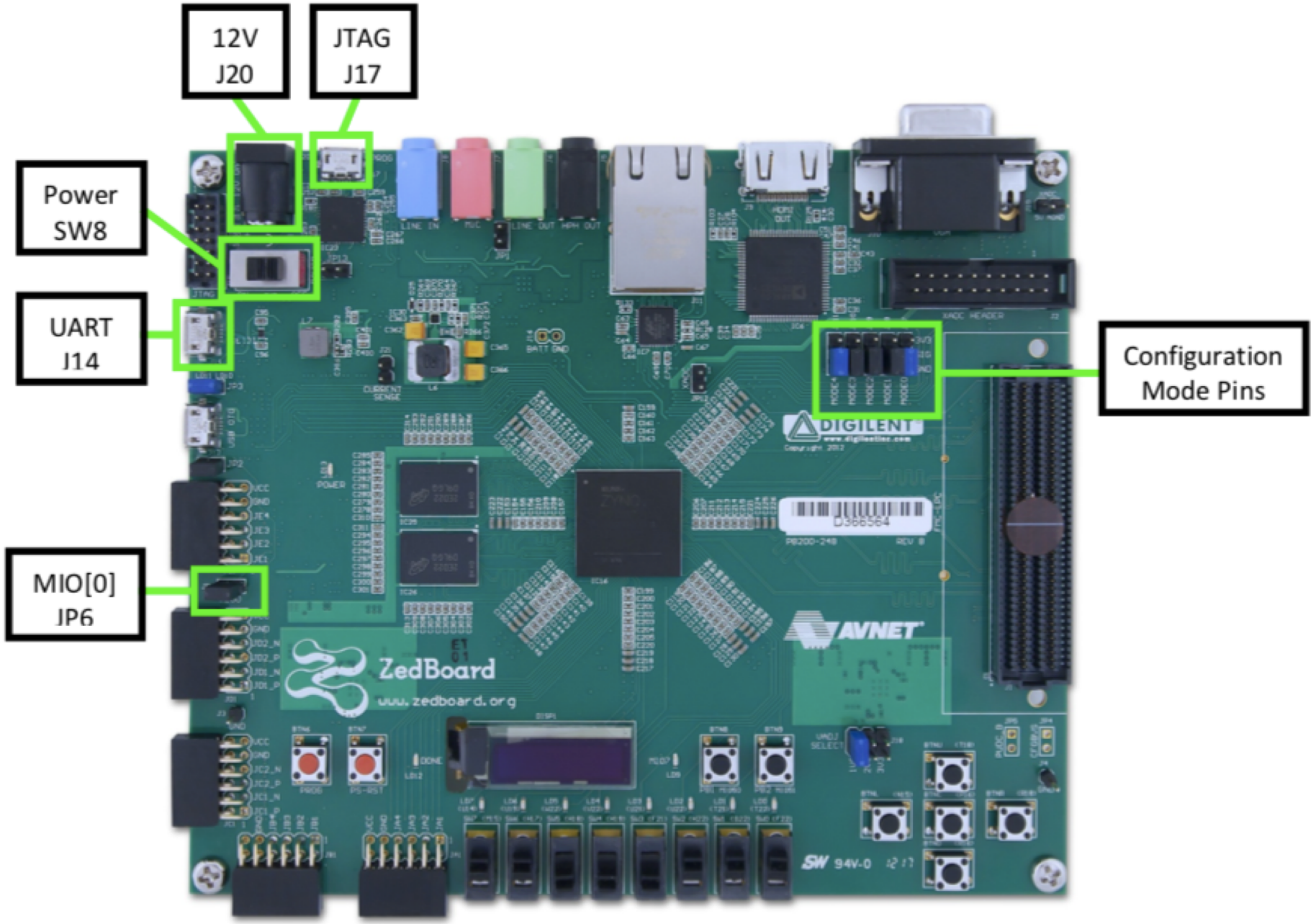
ZedBoard

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

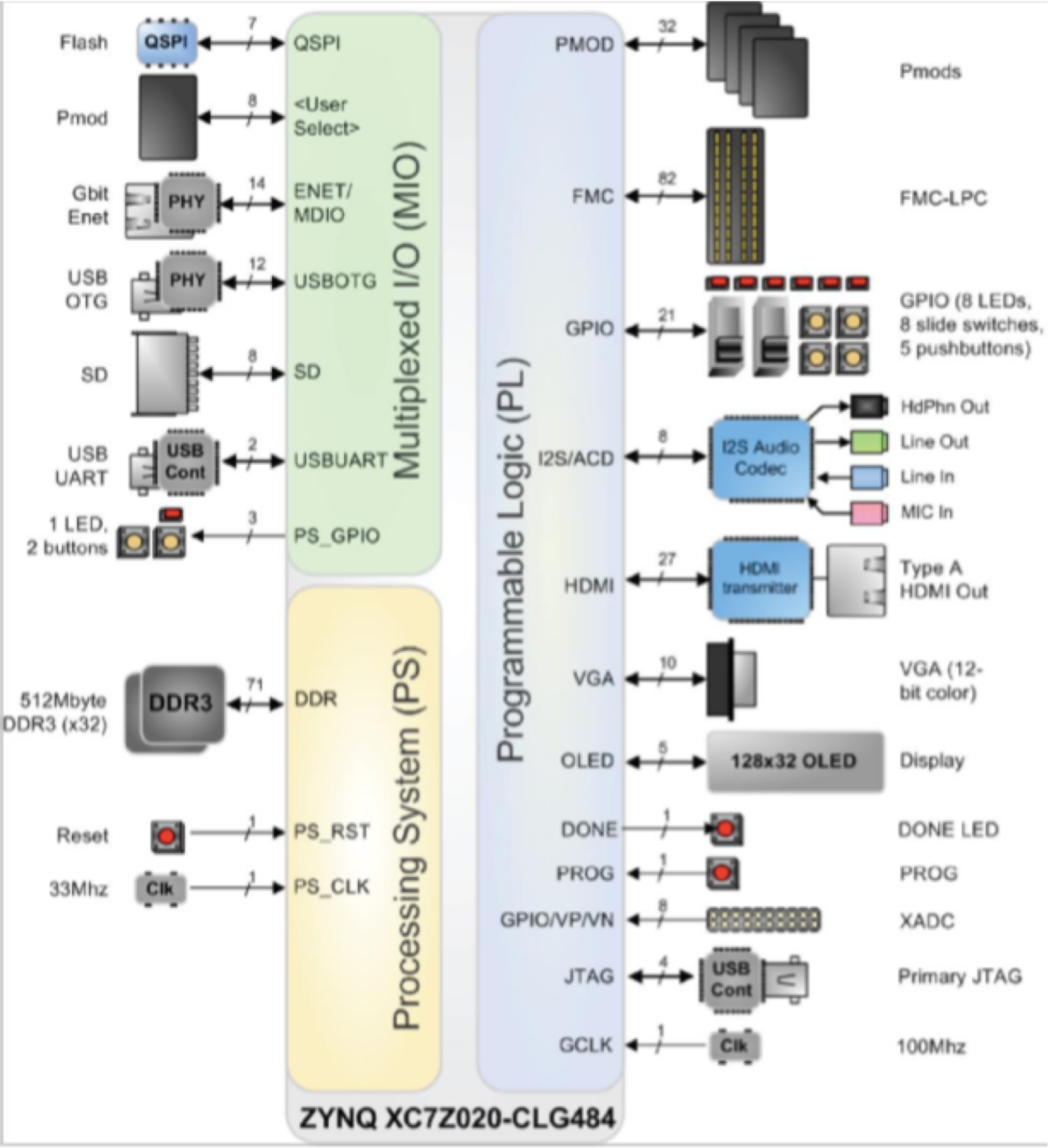
4GB SD card




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

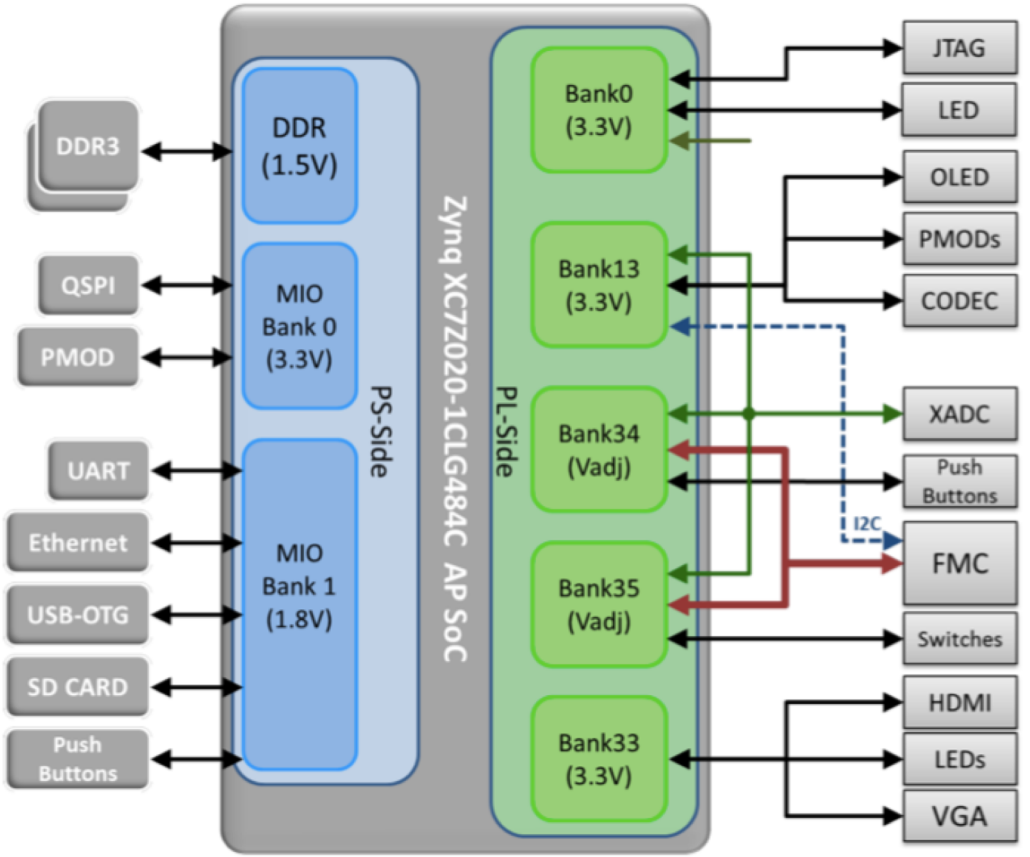
Configuration and Booting Guide http://islab.soe.uoguelph.ca/sareibi/TEACHING_dr/Xilinx_Boards_dr/ZedBoard_boot_guide_IDS14_1_v1_1.pdf

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




ZedBoard Hardware Block Diagram

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.



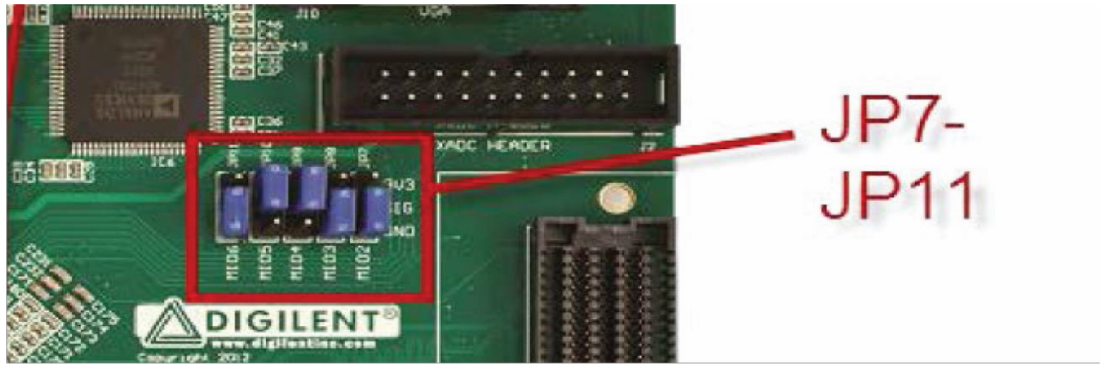

Zynq Z7020 CLG484 Bank Assignments

# Verification of Communication with ZedBoard

## Interacting with GPIO Switches and LEDs

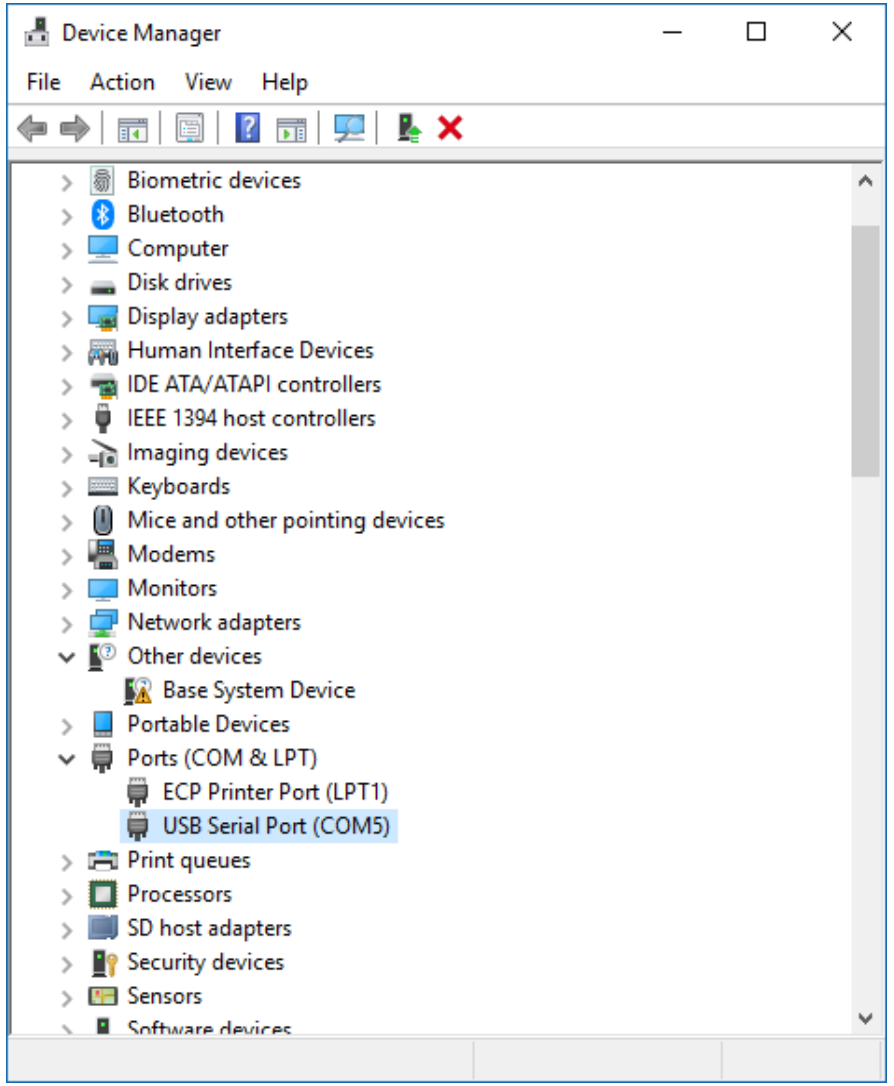
1. Connect 12 V power supply to barrel jack (J20).
2. Connect the USB-UART port of ZedBoard (J14) which is labeled **UART** to your machine using the MicroUSB cable.
3. Insert the 4GB SD card included with ZedBoard into the SD card slot (J12) located on the underside of ZedBoard PCB. This SD card comes 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
6. position. ZedBoard will power on and the Green Power Good LED (LD13) should illuminate.
7. 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

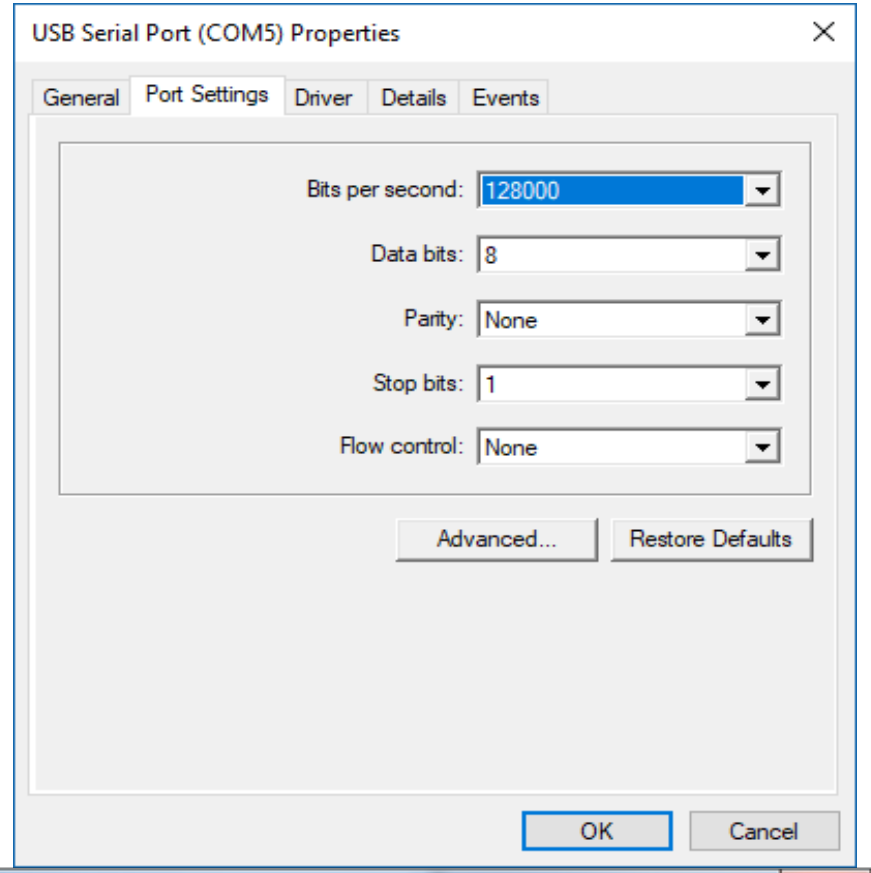
1. The PC may pop-up a dialog box asking for driver installation. ZedBoard has a USB-UART bridge based on the Cypress CY7C64225 chipset. Use of this feature requires that a USB driver is installed on your Host PC. If the host PC does not recognize the USB-UART and enumerate it as a COM port device (see 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.

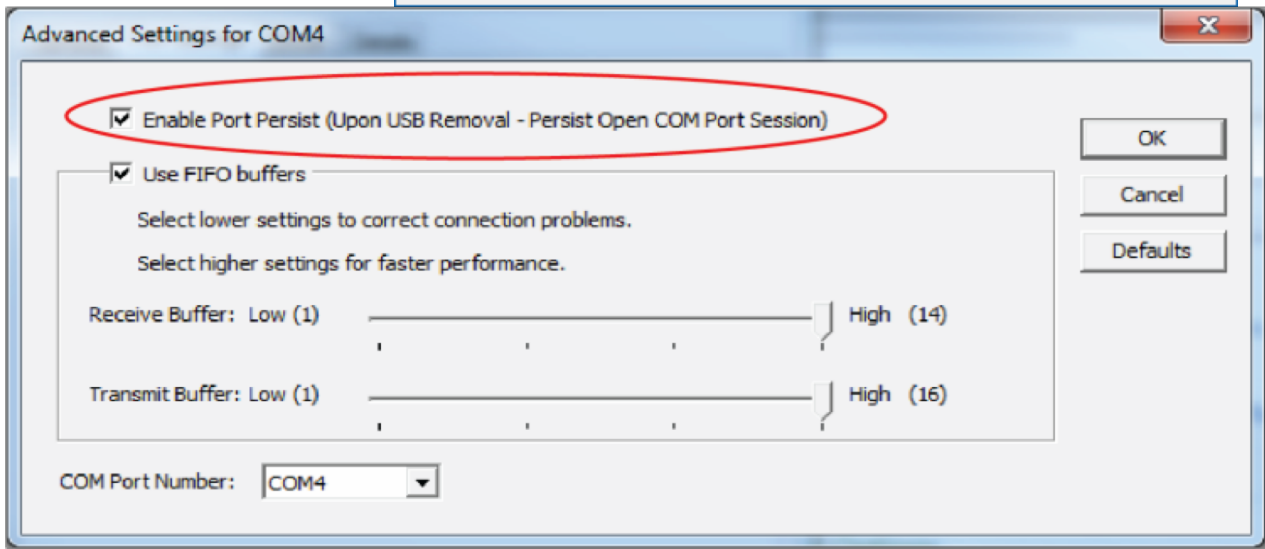


3. To enable ‘Port Persist’ mode double-click on the “USB Serial Port (COMx)” or “Cypress Serial (COMx)” port under “Ports (COM & LPT)” and adjust the settings in the “Port Setting” tab as shown below

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.

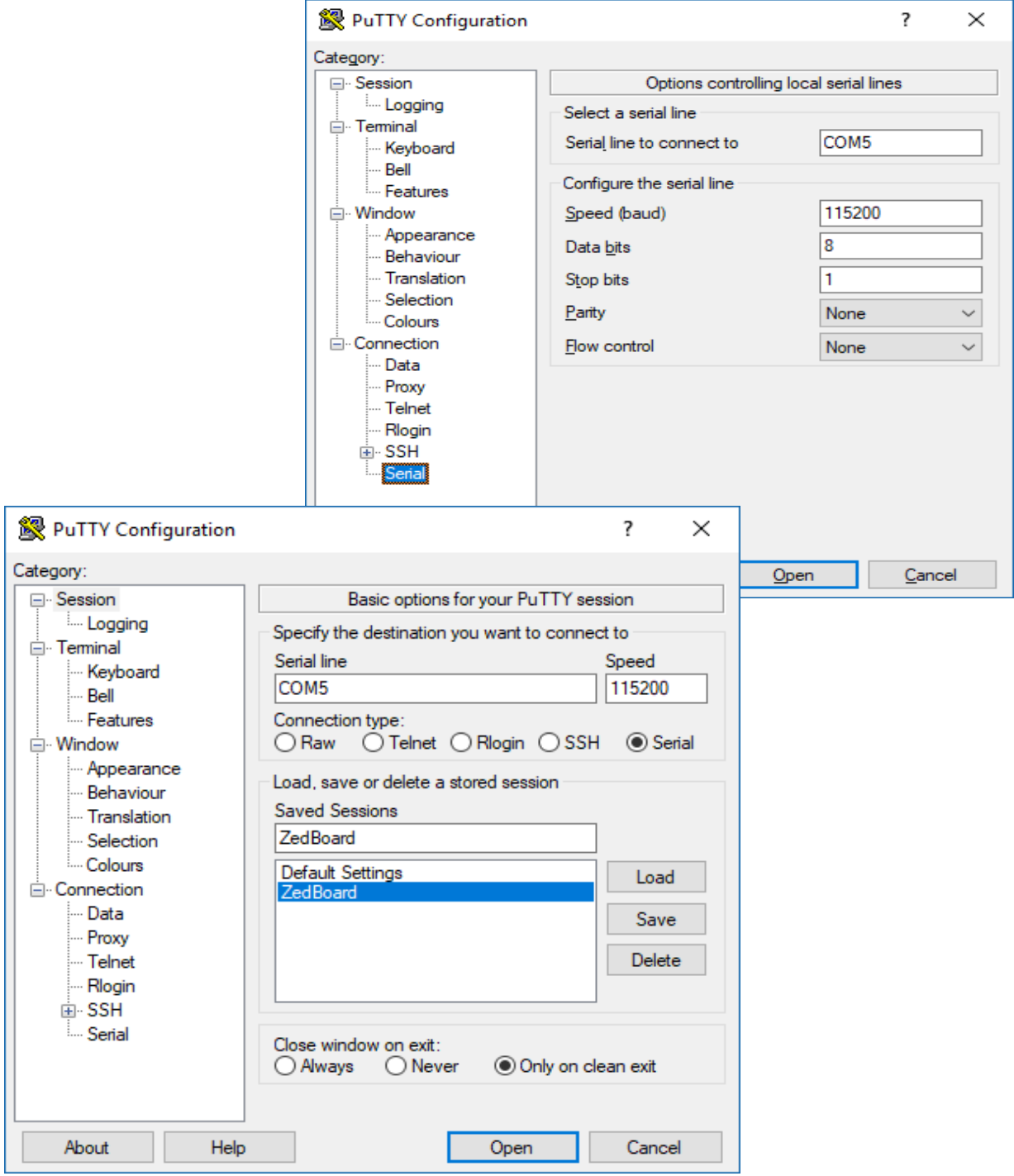
5. Download and install PuTTy.



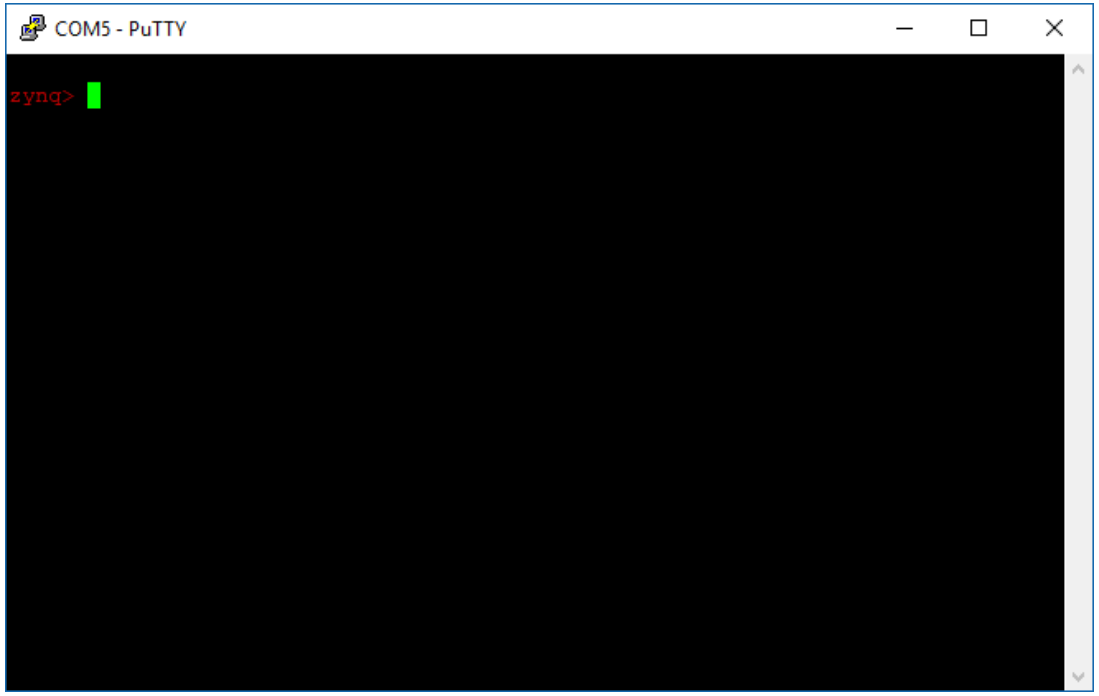



6. Once installed, open Putty, navigate to “Connection -> Serial” and make the following settings (use the COM port shown in the Device Manager of Step 2 above; in our case we use COM5).

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”.

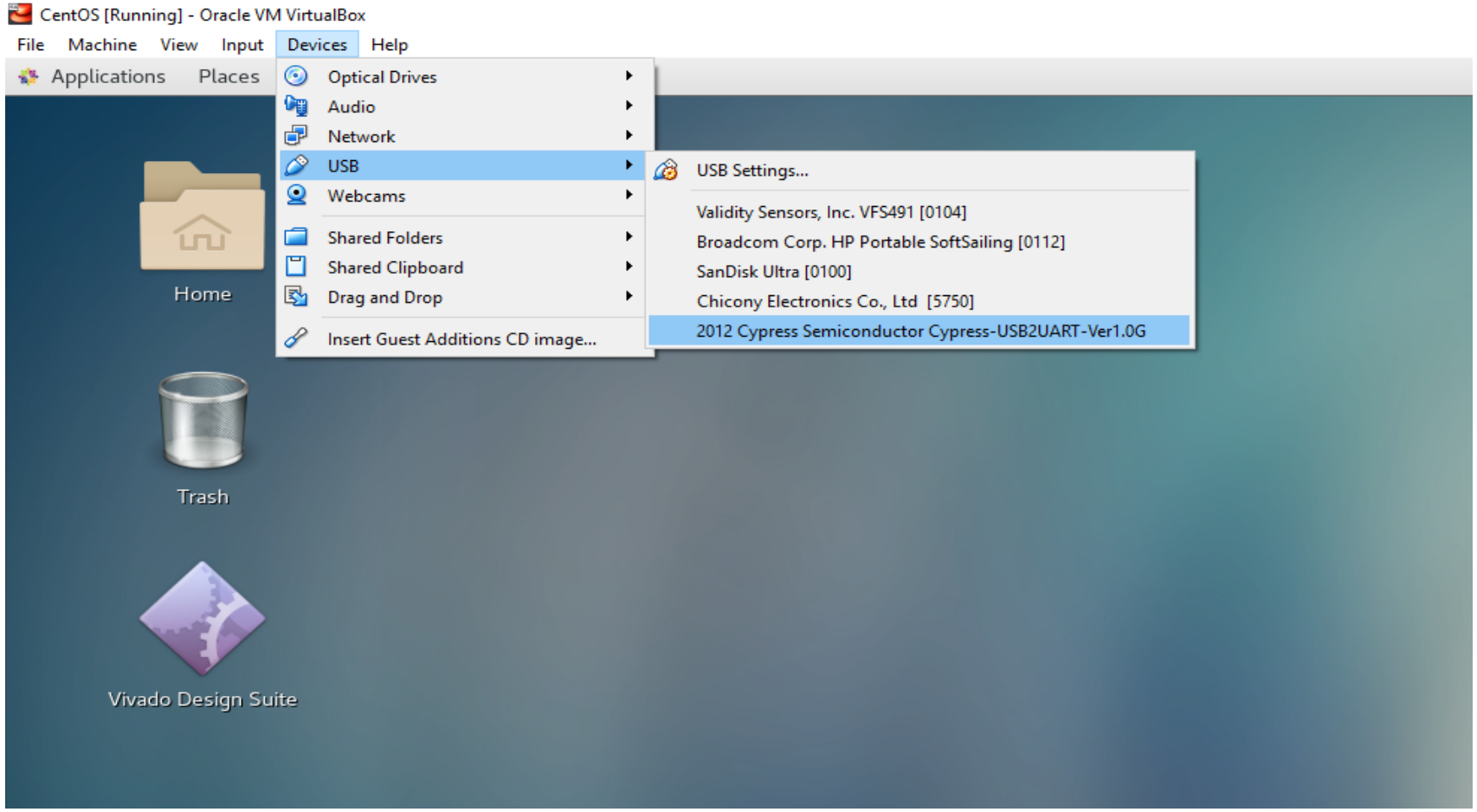


8. Click “Open”. At the new window that will show up hit “Enter” and you should see the following screen.
9. Type “write_led 255” and you should expect to see all LED to turn on. Similarly, if you type “write_led 0”, all of them will turn off.



# 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

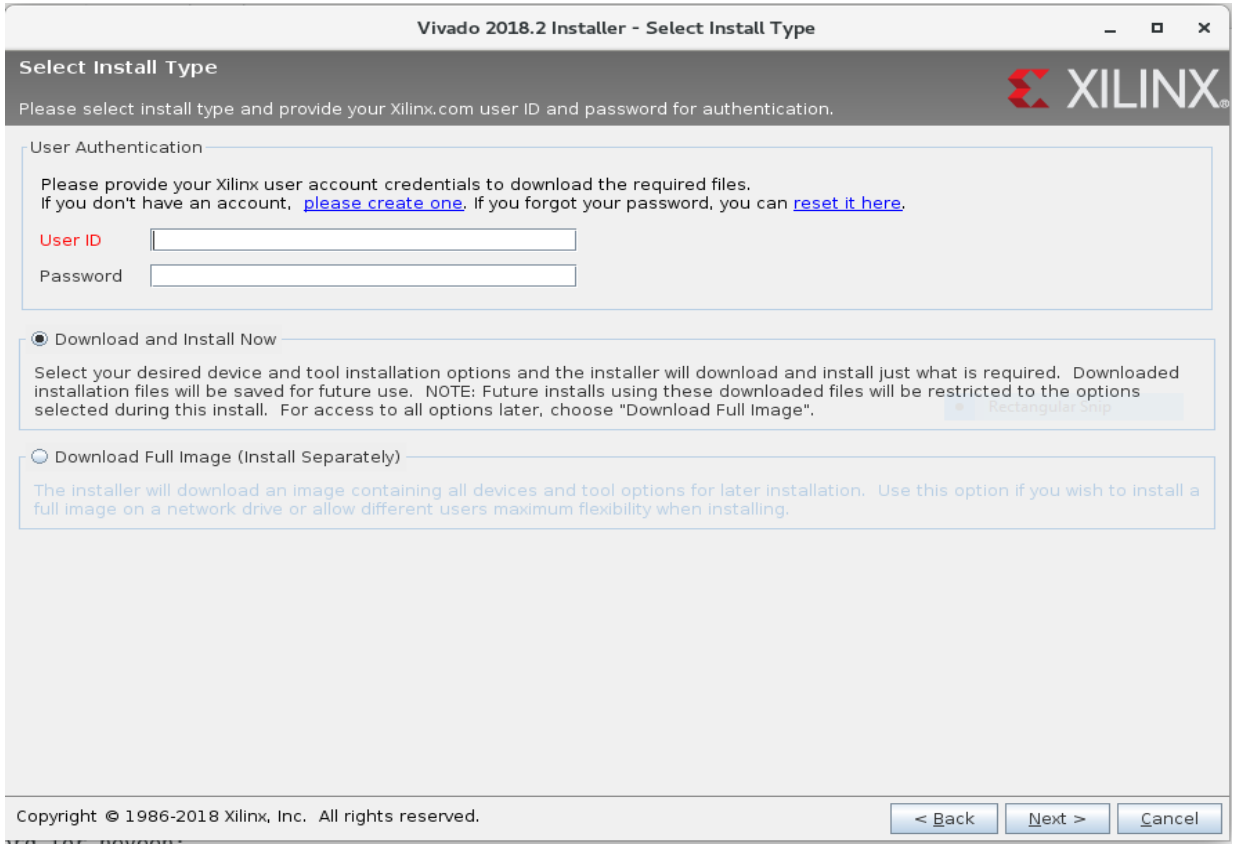
4. Press “Enter” on the next screen and you will see the following:

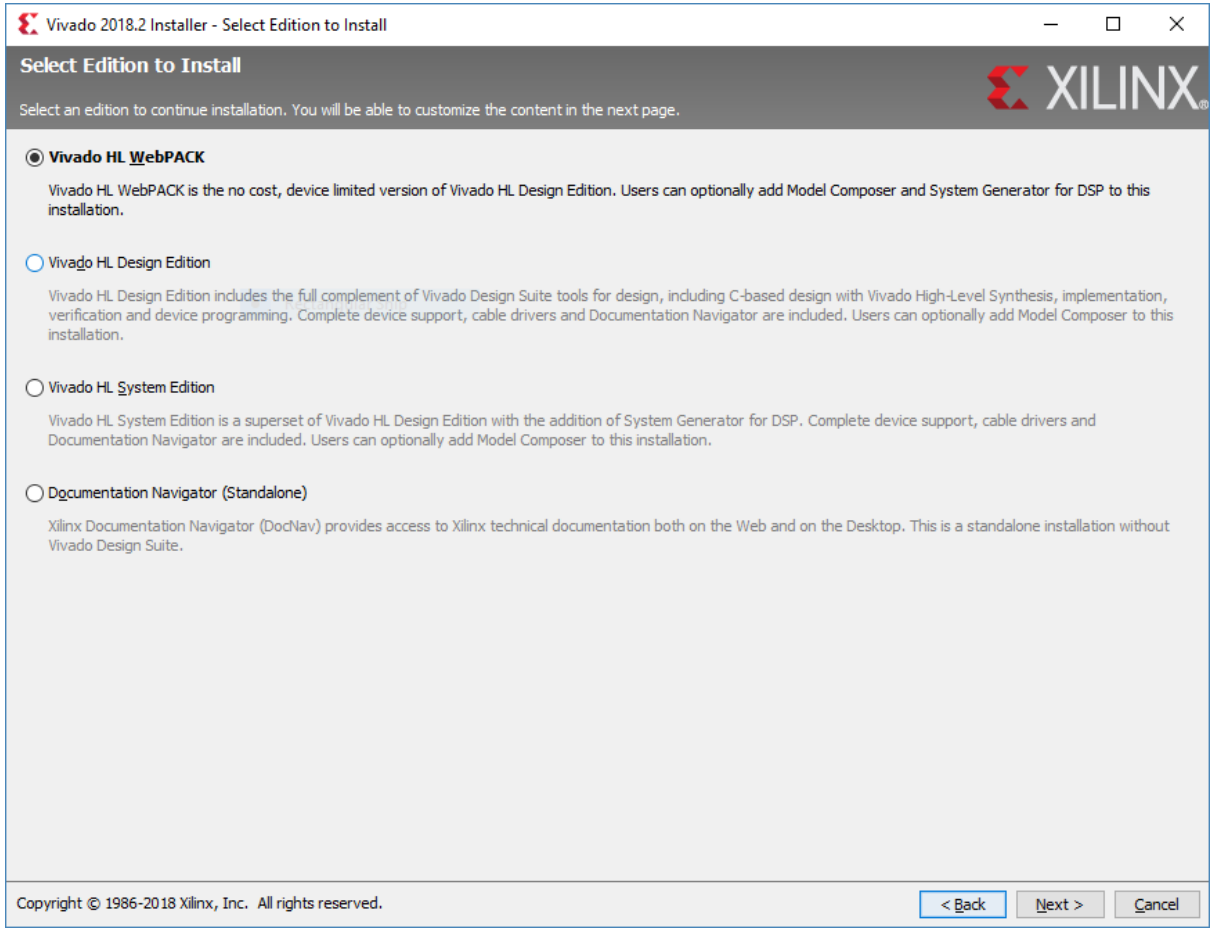

5. Type “write_led 255” and you should expect to see all LED to turn on. Similarly, if you type “write_led 0” , all of them will turn off. Also try “read_sw”.
6. More Demos

# 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”.

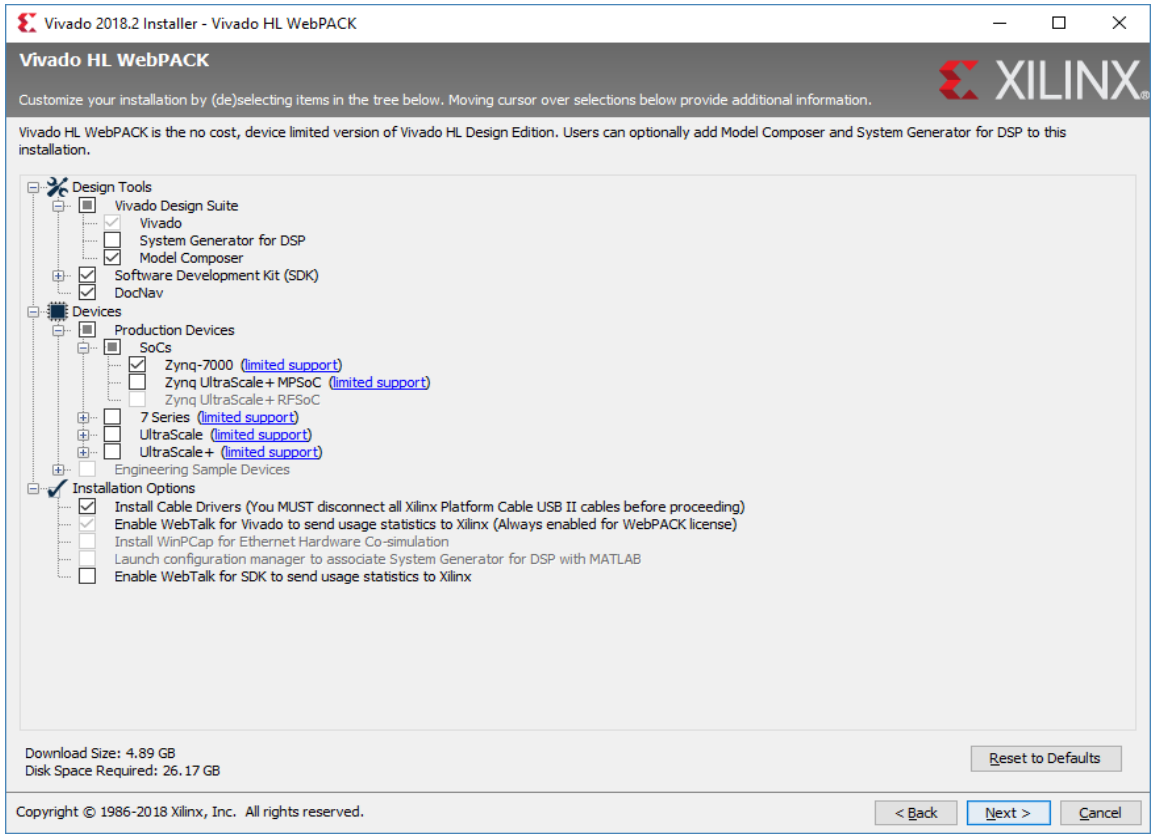


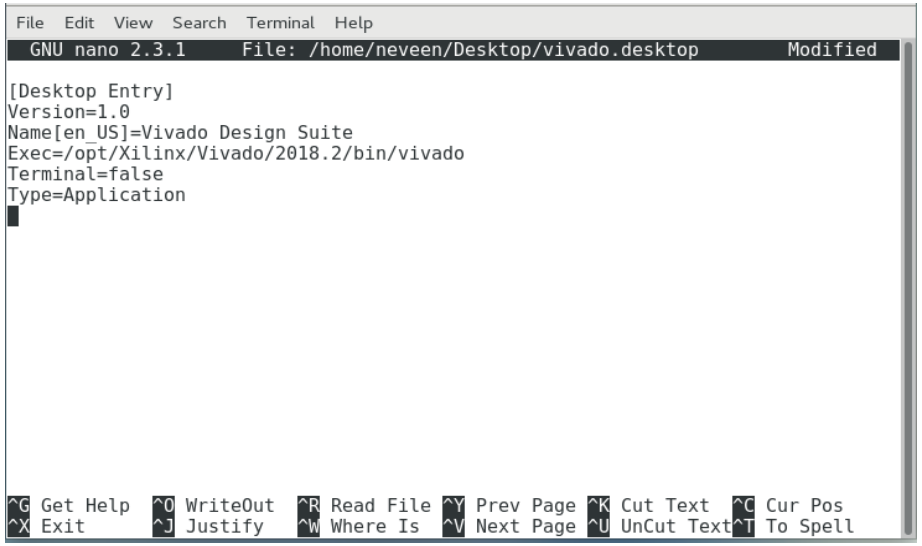




5. For the Edition to install, select “Vivado HL WebPACK” (the Design Edition requires paid license).

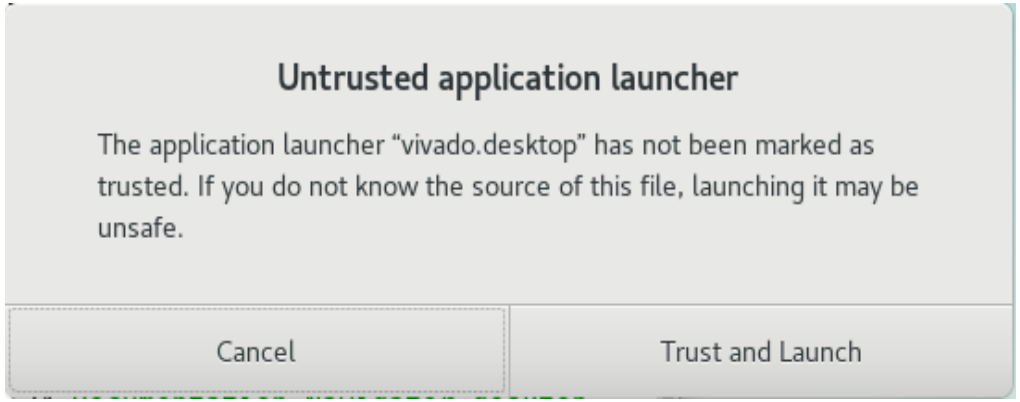
6. Make the following installation customization selections:

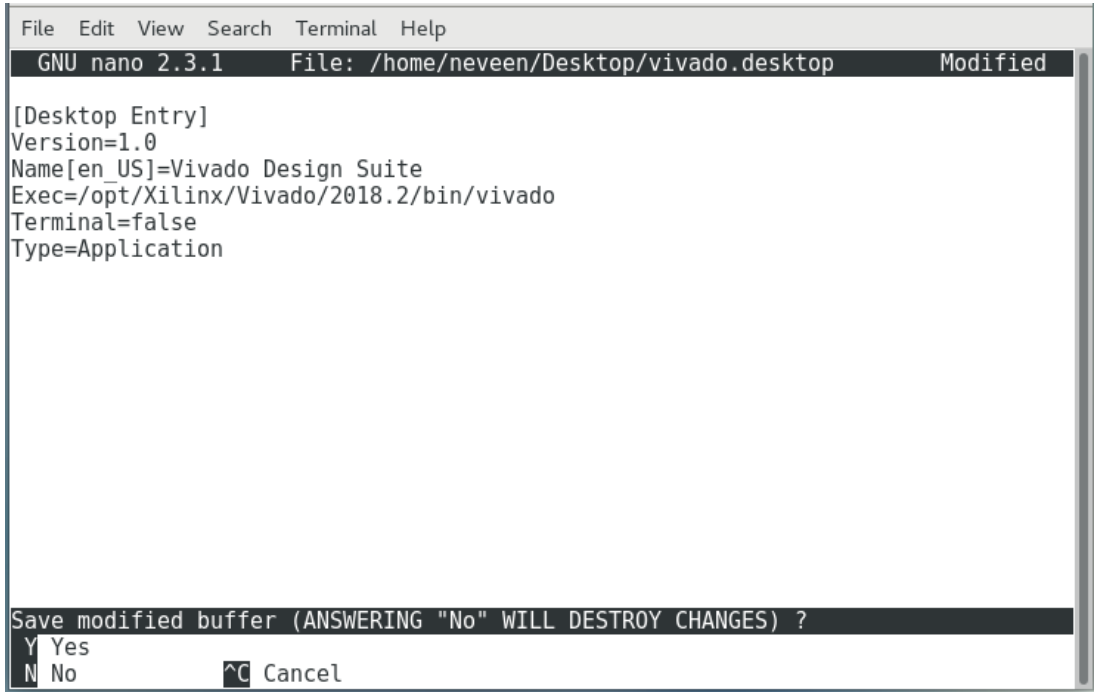
7. After installation, to open the software on **Windows** simply double-click the Desktop icon (Vivado 2018.2). On **Linux,** you can type the command in the Terminal
/opt/Xilinx/Vivado/2018.2/bin/vivado
or create a shortcut on the desktop, as follows:
   - In the Terminal, type:
     nano ~/Desktop/vivado.desktop
   - 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

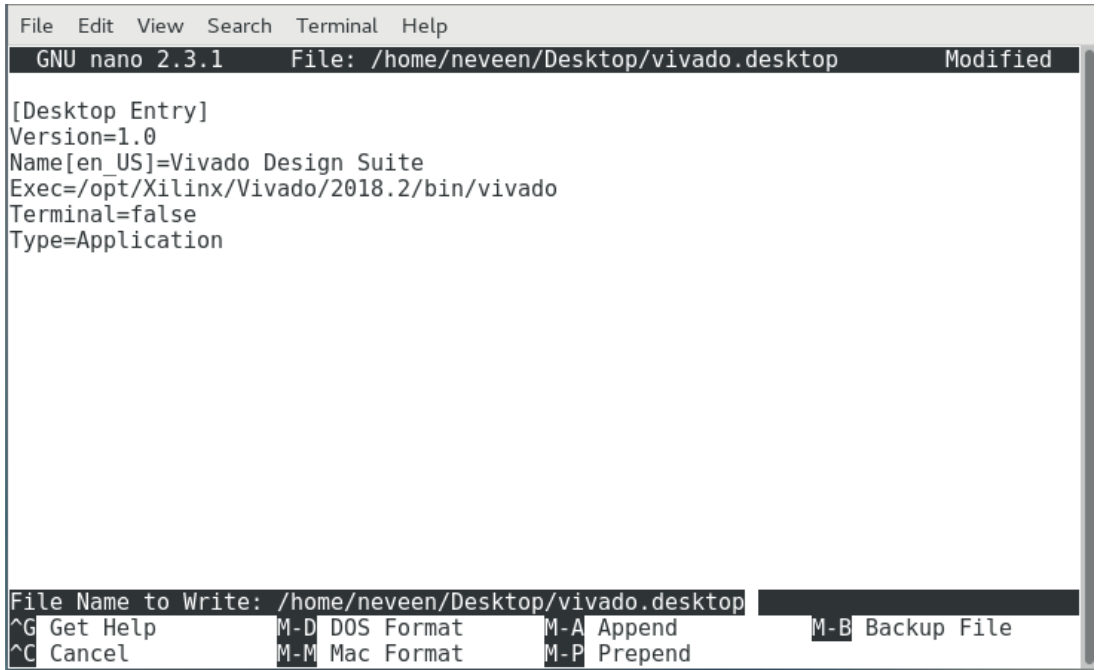


- Press “Ctrl + X”, the “Y” to save the file, and finally “Enter” (see screenshots below).
- A new file, named “vivado.desktop” , will be created in the desktop. By double-clicking on it, an “untrusted application launder” pop-up will be shown (see below), click “Trust and Launch”. The Vivado Design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

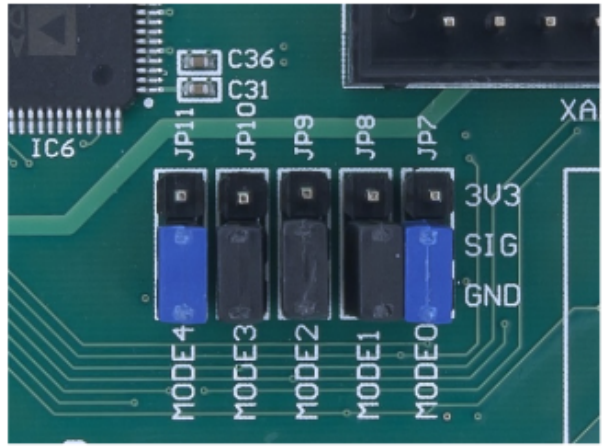


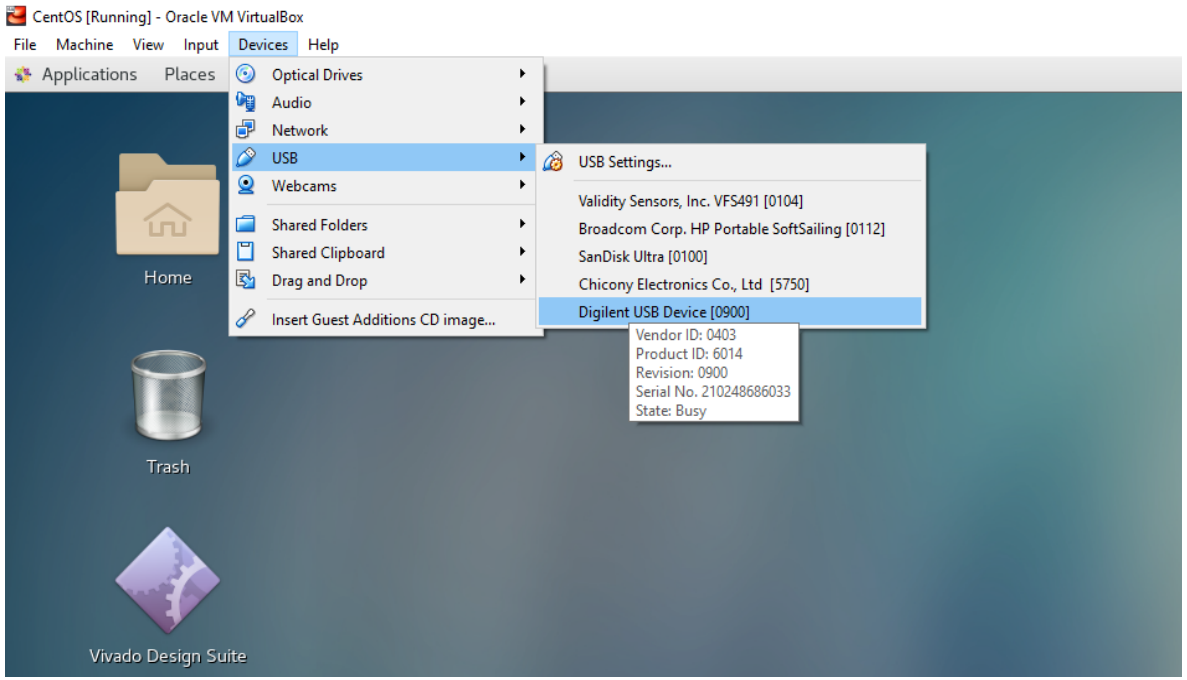



# Programing the FPGA through JTAG

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).



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