Getting started with Part6

Created by Eton Kan on November 22, 2017 with assistance from Dr. Craig Scratchley
Modified on November 28, 2017

Please <u>CLOSE VMware</u> before leave the computer or logging off

Create VMsf folder in your U drive (Window)

1) On the Window side, create a new folder in your root directory of your U drive called "VMsf". The path of the new folder must be "U:\VMsf"
2) Download "TimeStorm5_3-workspace.zip" from Canvas -> "MultipartProject" -> "Part6"
3) Extract "TimeStorm5_3-workspace.zip" on your desktop and copy the extracted folder inside the "U:\VMsf" folder. The path for the extracted workspace must be "U:\VMsf\TimeStorm5_3-workspace"
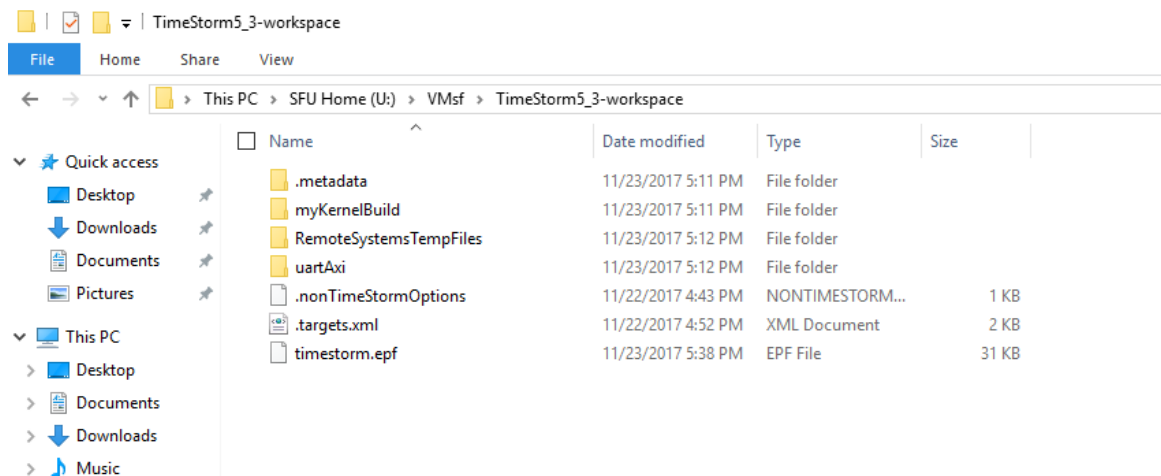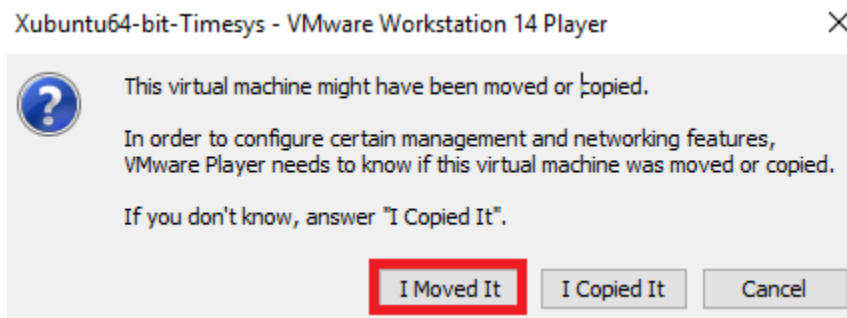

Starting VMware

1) Start VMware with "Xubuntu64-bit.vmx – ShortCut" on your desktop:
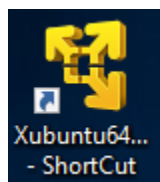
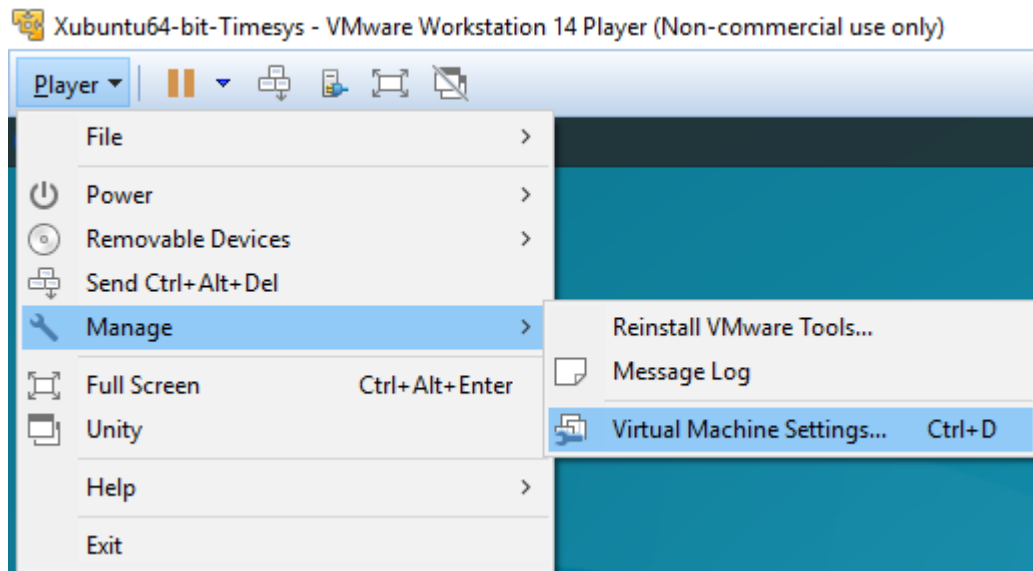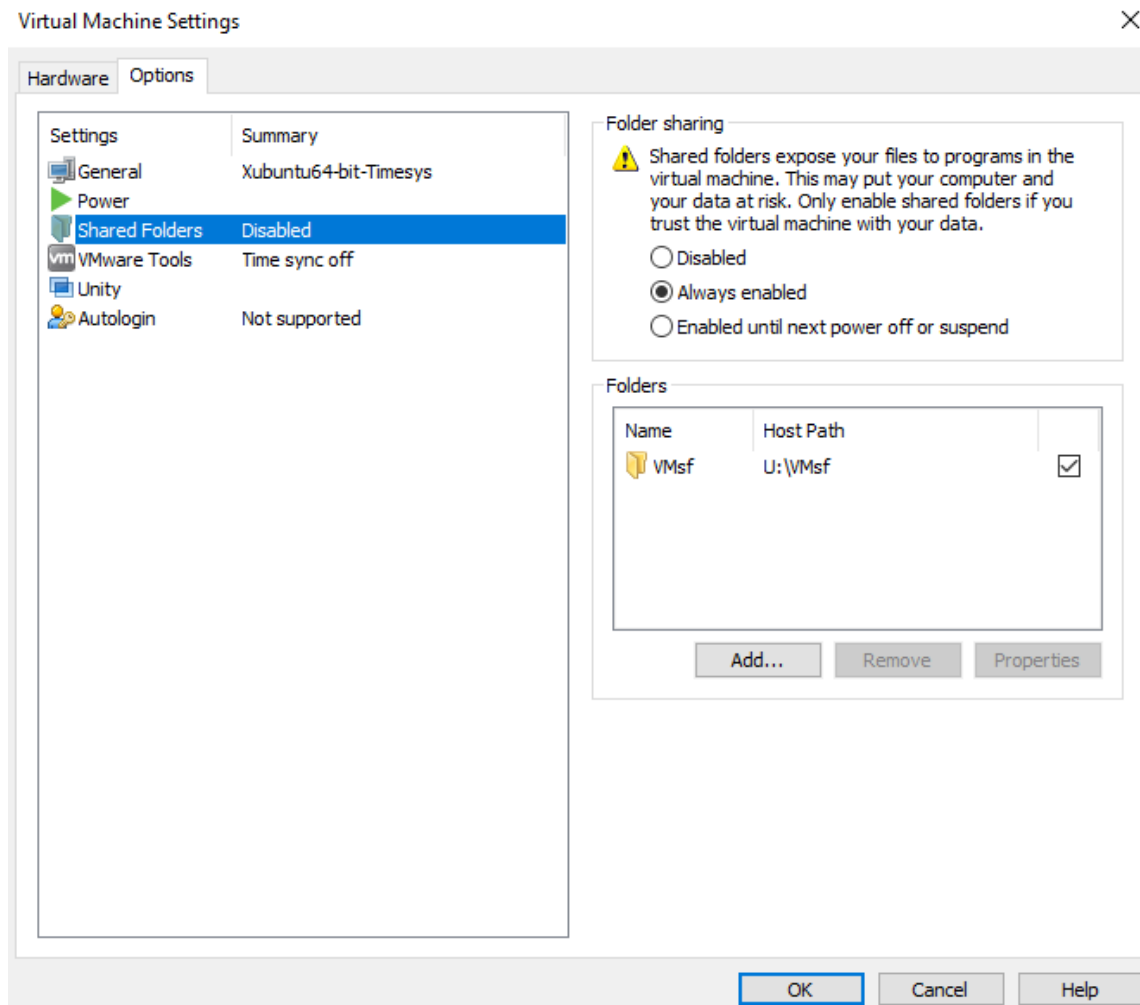# Please <u>CLOSE VMware</u> before leave the computer or logging off

2) Click "I Moved It" when you see the pop up.

3) Login to osboxes.org with password "osboxes.org"
4) Permanently enable Share Folder in "Player" -> "Manage" -> "Virtual Machine Settings…"
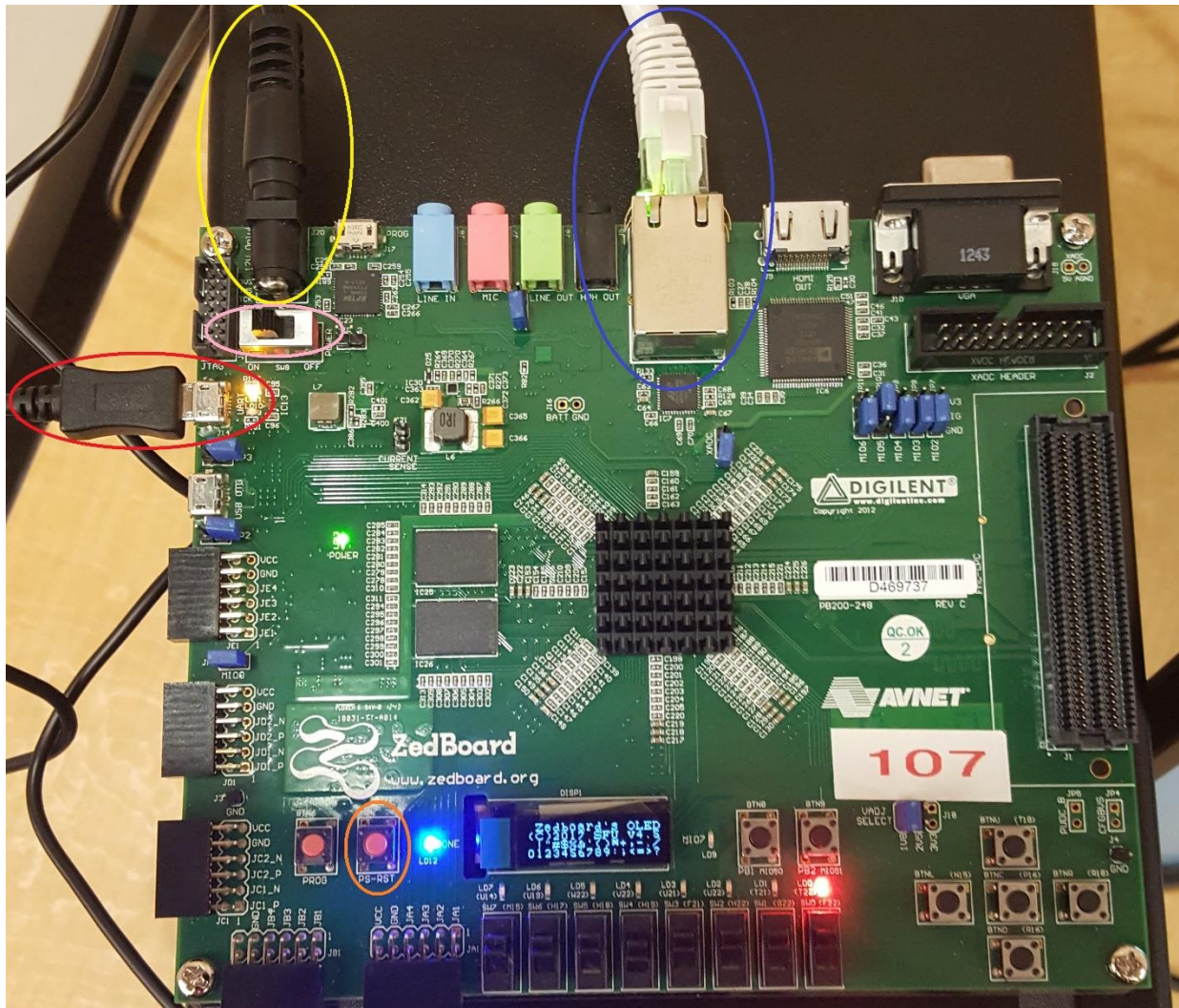
5) If not already with this setting, permanently enable share folder by selecting "Always enabled" under "Folder sharing".

Connecting your Zedboard

1) Connect the Power Supply (circled in yellow), Ethernet cable (normally found behind the lab computers, circled in blue) and the USB cable (circled in red) to your Zedboard according to the figure below.

2) After connecting all the cables and setting all the switches. Turn on the board with the switch circled in pink. Note: the rest button (will be used later in the tutorial) is circled in orange.
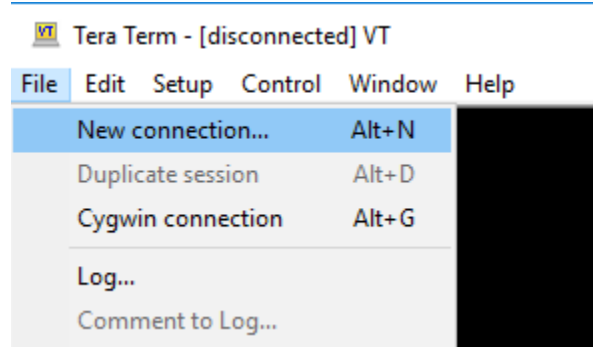
3) Go to Device Manager.
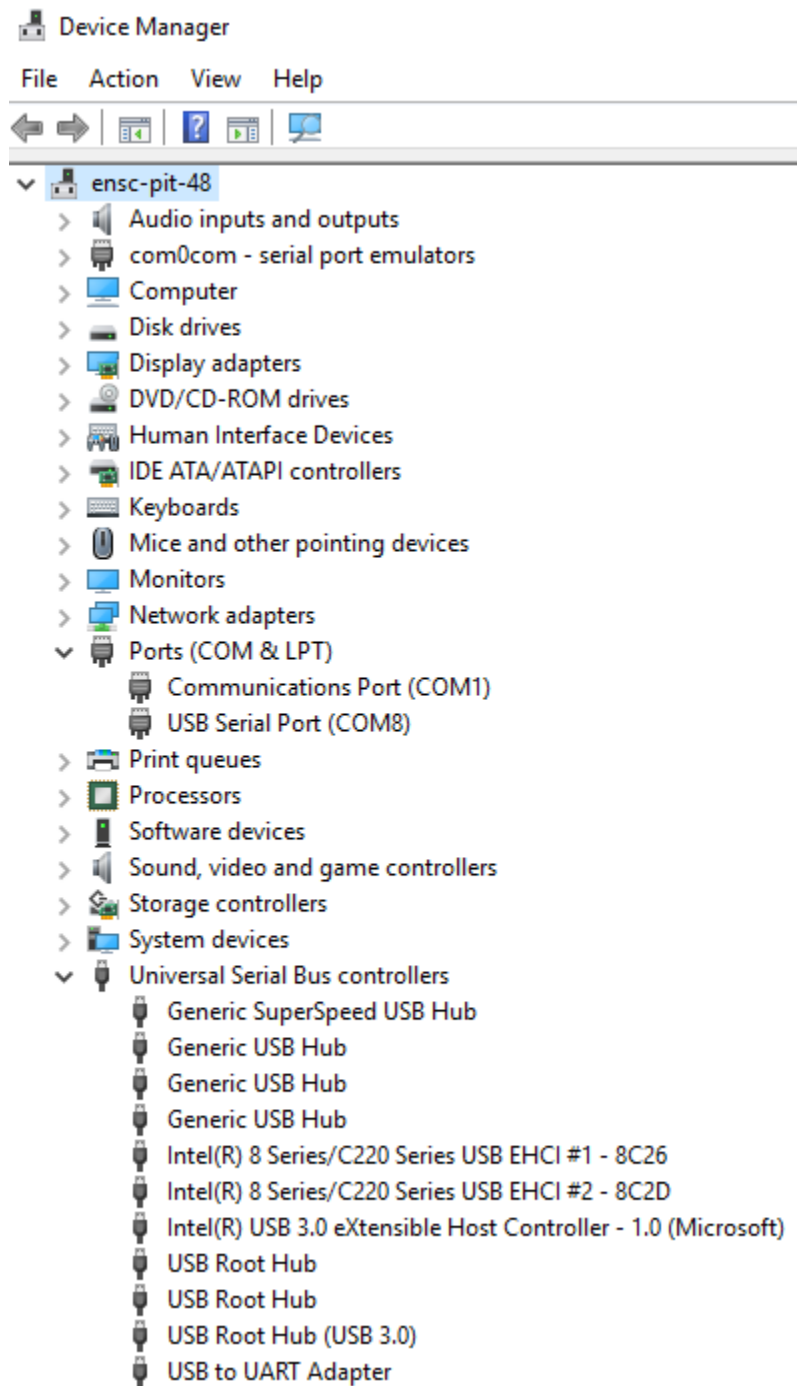
4) Make sure there are no yellow triangles beside the "USB to UART Adapter" icon. See figure below for an example. If the yellow triangle exist, just reinsert the USB cable.
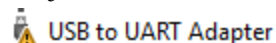
5) Open for "Tera Term" in the "Start Menu"
6) Go to "File" -> "New Connection…"

7) In the drop down menu for "Port:", select the USB Serial Port. For example, my USB Serial Port is COM8. The rest of the document will refer this Tera Term session as Kernel Tera Term session. Note: COM number may vary for different computers.
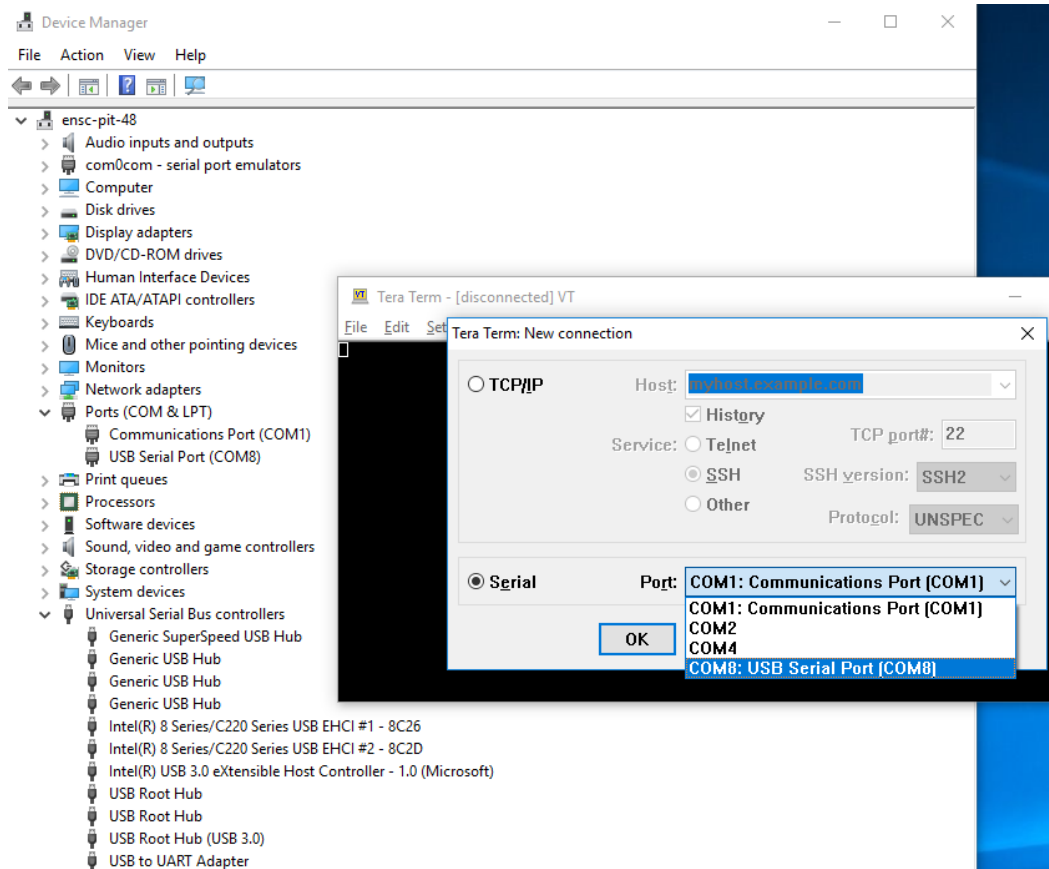
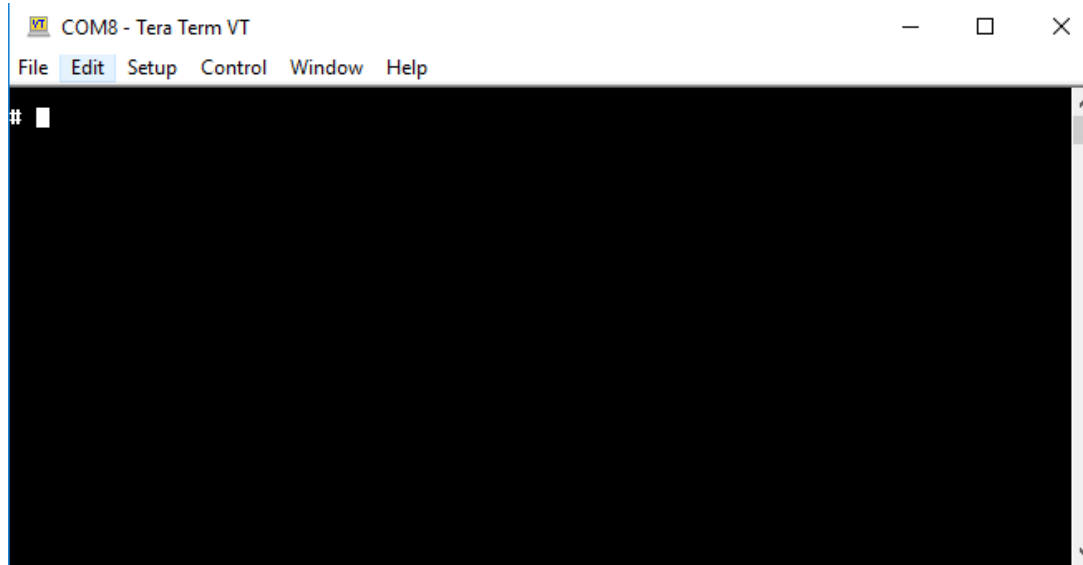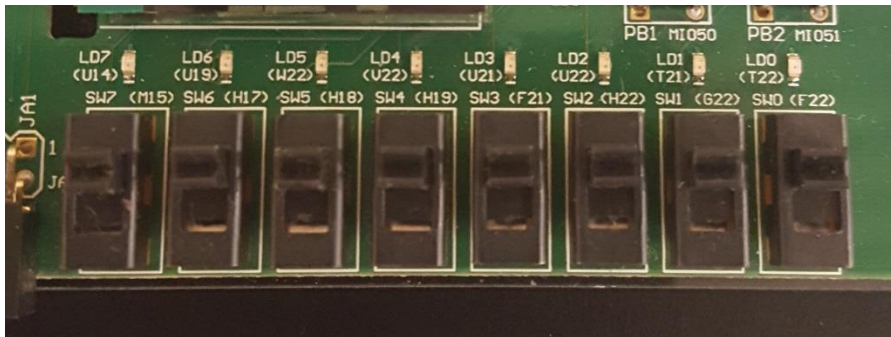8) After connecting to it, press enter key and see if "#" show up in the output. If the console output some other messages, please reset your Zedboard by using the reset button described in step 2.

Steps 9 through 17 are just to test that things are working as expected.

9) Move all eight switches to the up position

10) In the VM, open a new terminal and type in the following command:
  ssh root@Zedboard
11) When the terminal ask for password, just hit "Enter" to continue
12) In the terminal, enter these commands one by one:
  /sbin/insmod /lib/modules/4.4.0-ts-armv7l-xilinx/kernel/drivers/tty/serial/8250_base.ko
  /sbin/insmod /lib/modules/4.4.0-ts-armv7l-xilinx/kernel/drivers/tty/serial/8250.ko

  Type the following command to make sure ttyS0 to ttyS7 showed up in the console
  ls -l /dev/ttyS*

13) Continue entering command…
  /sbin/insmod /lib/modules/4.4.0-ts-armv7l-xilinx/kernel/drivers/tty/serial/of_serial.ko

  The Kernel Tera Term console will output messages from of_serial kernel module.
14) Then run the following command and make sure "ttyS0", "ttyS1" and "ttyS5" exist in the output
  ls -l /dev/ttyS*

If either "ttyS0", "ttyS1" or "ttyS5" are missing in the list, we need to reinstall the of_serial module using the following two commands.

    /sbin/rmmod of_serial.ko

    /sbin/insmod /lib/modules/4.4.0-ts-armv7l-xilinx/kernel/drivers/tty/serial/of_serial.ko

Repeat step 14 to see if it works.

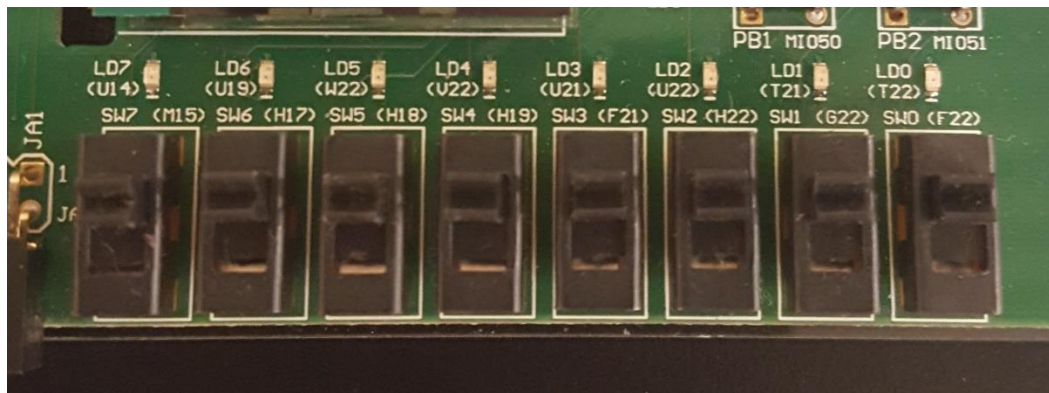15) Then enter the following command in Kernel Tera Term session

    cat /dev/ttyS1

16) Then enter the following command in the terminal

    echo Hello > /dev/ttyS0

17) The word "Hello" should appear in your Kernel Tera Term console. Hit ^C to terminate the cat program.

Wire cutting (with example)

1) Wire cutting are controlled via switches on the Zedboard. When a switch is in up position, it mean the wire is connected. When the switch is in the down position, it mean the wires are cut.

2) Each switch represent a different wire (from right (SW0) to left (SW7))

    0. Micro USB PMOD rx (SW0) (/dev/ttyS5)

    1. Micro USB PMOD x (SW1)

    2. RS232 PMOD rx (SW2) (not used this term)

    3. RS232 PMOD tx (SW3) (not used this term)

    4. Crossover 1 (SW4)

    5. Crossover 2 (SW5)

    6. Loopback tx (SW6)

    7. Replacement signal value (0 or 1) to receiver end of the cut wires (SW7)

3) Using the SW4 which control the Crossover 1 as an example (assuming you have the 3 mod installed, step 12 and 13 of Connecting Your Zedboard)

    a. Move all the switches to the down position except Crossover 1 (SW4)

    b. Then enter the follow command in Kernel Tera Term session

        cat /dev/ttyS0

    c. Then enter the follow command in the terminal with the SSH session open

        echo SW4Up > /dev/ttyS1

    d. "SW4Up" should appear in your Kernel Tera Term console.

    e. Now put Crossover 1 (SW4) in the down position

f. Then enter the follow command in the terminal with the SSH session open

   echo SW4Down > /dev/ttyS1

g. "SW4Down" shouldn't appear in the Kernel Tera Term console. Note: SW4 cuts the Crossover 1 wire and prevent the "SW4Down" message to go through.

h. Now move Crossover 1 (SW4) back to the up position and repeat step f

i. "SW4Down" should appear in the Kernel Tera Term console. Hit ^C to terminate the cat program.

j. From the example above, we observe that ttyS1 is linked to ttyS0 via Crossover 1 (SW4).

Connecting your PMOD to the ZedBoard

1) Move the eight switches (circled in red) on your Zedboard to up position.
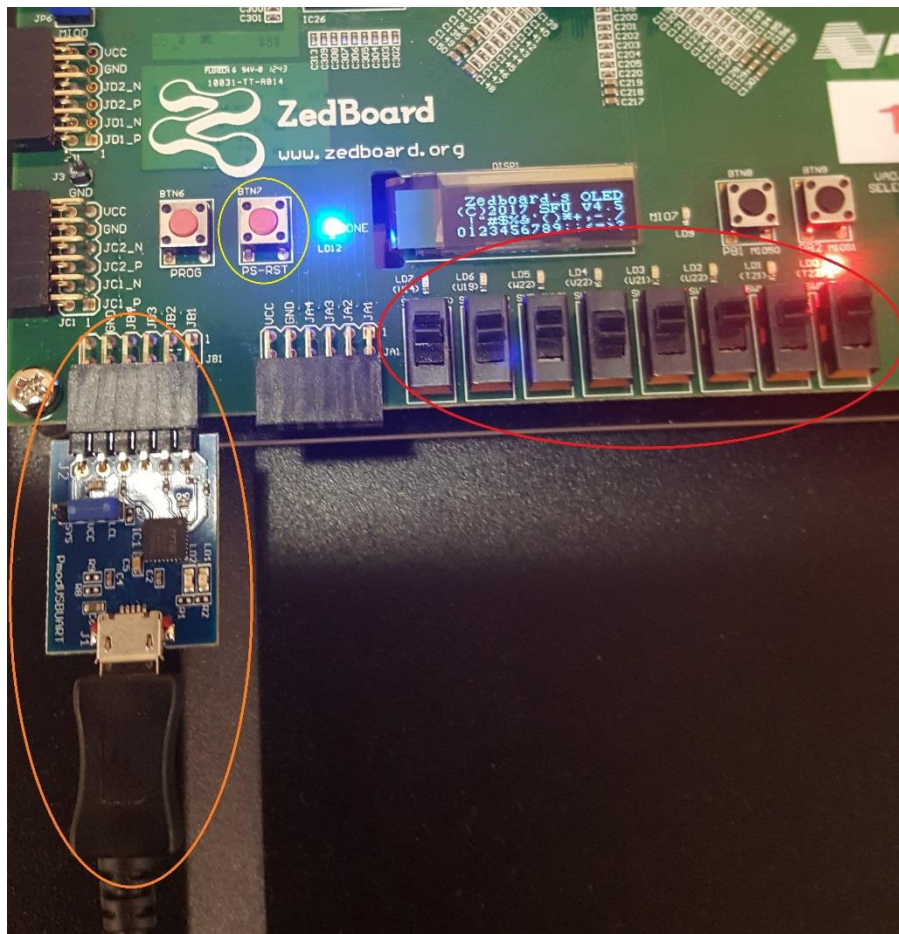
2) Then insert the PMOD (blue module in the figure above) to the upper row of the connector (jumper side up as shown in the figure above).

3) Start another Tera Term session and connect to the new USB Serial Port (see Steps 5, 6, and 7 for more detail!). The rest of the document will call this new Tera Term session as PMOD Tera Term session.

4) Go to "Setup" -> "Serial Port…" -> in the dropdown menu for "baud rate" -> choose "300" -> "OK"
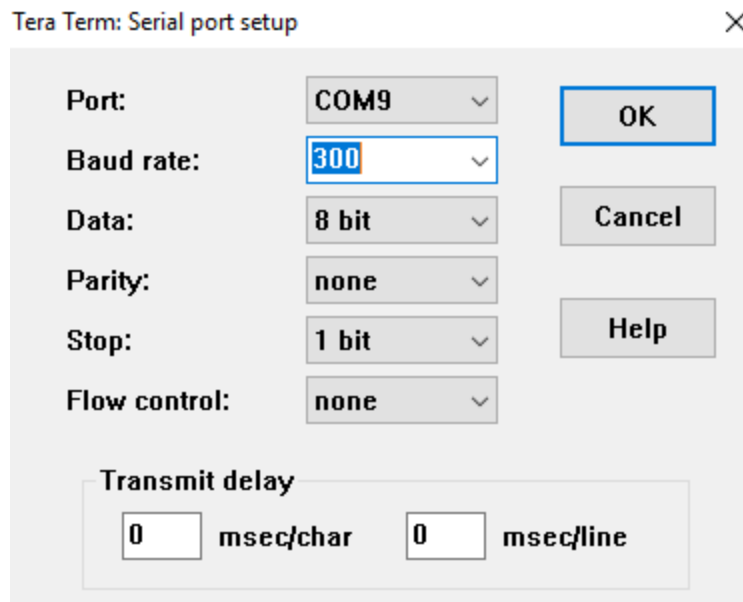
5) In the previous terminal (the one that is running SSH), enter in these commands

  stty -F /dev/ttyS5 300

  echo Hello > /dev/ttyS5

Then word "Hello" should appear in the PMOD Tera Term session.

6) In the terminal with SSH active, enter the following command

  cat /dev/ttyS5

Then type "Hi" in PMOD Tera Term session and "Hi" should come out from the terminal with SSH active.

7) Hit ^C in the terminal to terminate the cat program

8) Now reset the Zedboard so you can proceed to the steps below. Reset by hitting the red "PS-RST" button (circled in yellow in the figure above) – twice if necessary. Alternatively, you can "rmmod" the three kernel modules inserted on steps 11 and 12 of "Connecting your Zedboard".
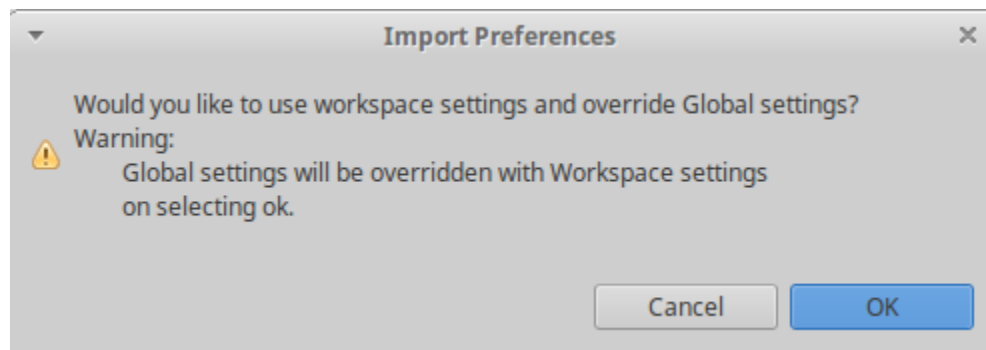
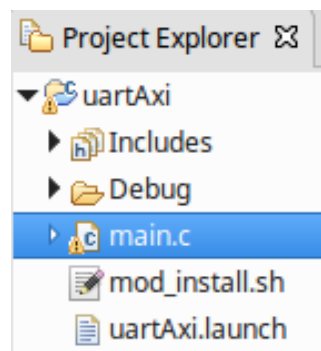## Start Timestorm

1) Launch "Timestorm" in the Virtual Machine
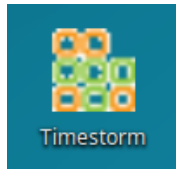
2) Uses the default workspace and click "OK" to continue.
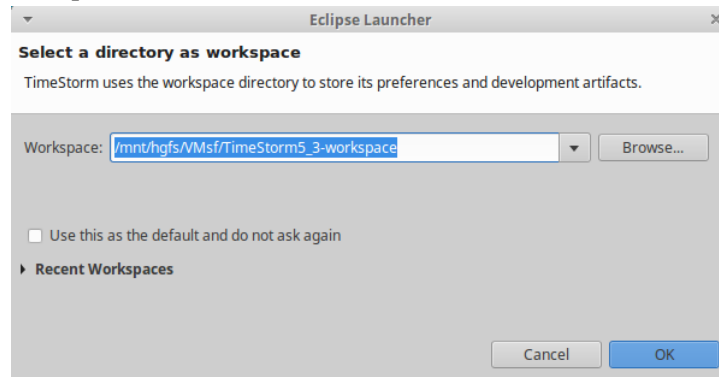
3) Shortly after launching Timestorm, there will be a pop up like the figure below. Select "OK" to continue.

4) Check in the "Project Explorer" tab to see if it match the figure below.

Running the Kernel Module (Timestorm side)

1) Click on the "uartAxi" in "Project Explorer" and click on "Build" (hammer icon)
2) Load the Kernel Module on the board by choosing "1 uartAxi" (highlighted in red) from the dropdown menu beside the "Run As…" button.
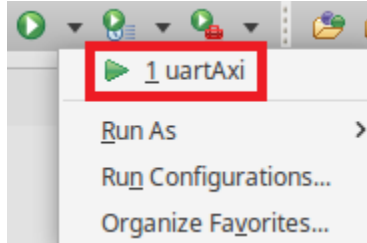
3) If you get an error that is related to Launching uartAxi (see figure below), please check on your Kernel Tera Term session to make sure your output is "#" when you press enter. If the output is different, press the reset button to reset your Zedboard (step 7 of Connecting your PMOD to the Zedboard).
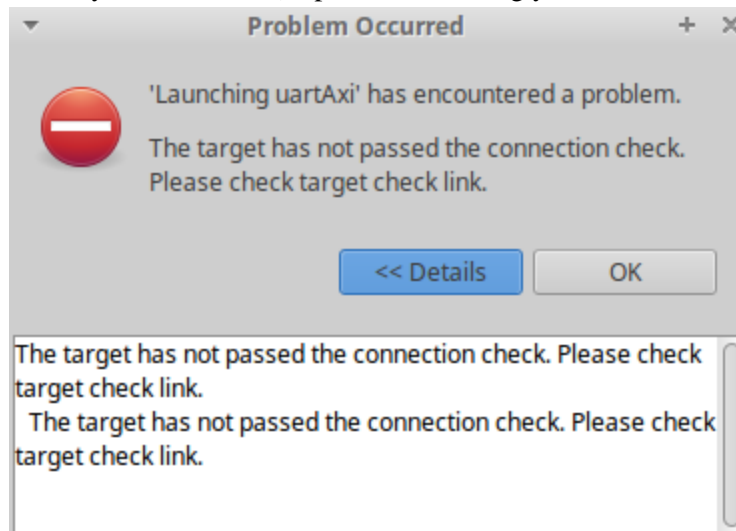
4) Check the console and make sure the output reassemble the one in the figure below

5) Check the Kernel Tera Term session that you have opened for its output. It should reassemble the figure below.

```
# uart_init: MODNAME=uartAxi
uart_init: uart_dev.minor=58
uart_init:Creating device file
uart_isr: intid=0x1
end of uart_tasklet_func
```

uartAxi Kernel Module's Serial Port

1) In the VM, start a new SSH session in terminal with the following command and press enter when it ask for password (similar to step 9 in Connecting your Zedboard)
    ssh root@Zedboard
2) If you reset your board earlier, SSH and both Tera Term connections maybe disconnected. Please reconnect to all three of them before continuing.
3) In the PMOD Tera Term session (remember to set baud rate to 300), type in "Hello"
4) Check the Kernel Tera Term Console session and you will see the word "Hello" is separated into five different lines with extra debugging output inbetween.
5) Then in the terminal with SSH active, type the following command
    cat /dev/tty_USB_351
6) "Hello" should be outputted on the SSH terminal
7) Notice that this serial port only works in one direction (from PMOD Tera Term session to SSH). Your task is to write the code so that the serial port will work in the other direction too.

Testing Procedures (Expected output)

1) In the VM, if you have not already done so, start a new SSH session in terminal with the following command and press enter when it ask for password (similar to step 9 in Connecting your Zedboard)
    ssh root@Zedboard
2) Then enter the following command in the terminal with the SSH session
    echo Hello > /dev/tty_USB_351
3) "Hello" should be output in the PMOD Tera Term console when you have coded necessary lines in the Kernel Module.

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