

# COP 5615: Distributed Operating Systems Principles

Fall 2016

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## Lab Assignment 0

### Xinu Personal Lab Setup

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#### Objectives: Loading Xinu to the BeagleBone Black

##### A. Mac & Linux Version

1. Follow the steps on <http://beagleboard.org/getting-started> up to **Step 2** to install the necessary BBB drivers. Be sure to restart afterwards.

**NOTE:** On Mac, you may want to install the newest version of the “Network” driver from <http://joshuawise.com/horndis>, rather than the one in step 2.

2. Install the drivers for the USB-TTY cable. The site you ordered the cable from probably has a download link for these. If not, the ones on <https://www.adafruit.com/product/954> should work as well.
3. Plug in the TTY cable into the serial header. The serial header is the only set of “male” connectors on the board, and is labeled **J1**. Connect the **black** wire to **pin 1**, the **green** to **pin 4**, and the **white** to **pin 5**. Pin 1 can be identified by the small white dot next to it.

**IMPORTANT:** Do **not** connect the **red** wire anywhere on the BBB. Doing so may damage the board.

4. Identify the device name of the TTY cable. This will be in the **/dev** directory, and will likely start with “tty” and include “usb” and “serial” in its name. For example the device may be named “**/dev/tty.usbserial**”.
5. Download the ARM version of Xinu from <http://www.xinu.cs.purdue.edu> and extract the files from the “tar.gz” archive.
6. Open a new terminal window and navigate to the Xinu compile directory with:  
`cd <path to untarred xinu directory>/compile`
7. Start a serial terminal with **115200** baud using the command:  
`screen <device name> 115200`

8. Plug in the mini USB cable on the BBB, and immediately start pressing the **return** key in your terminal window. This will interrupt the BBB bootloader, allowing you to upload the Xinu image.
9. You should have a U-Boot prompt in your terminal window. Enter the command:  
loady
10. In your terminal window, enter the key combo **ctrl - a** followed by a ":" (a colon). This allows you to perform a command in the context of the serial connection. You should see a highlighted line in your terminal.

11. Enter the following command to upload the Xinu image:  
exec !! sz --ymodem xinu.boot

**NOTE:** On Mac, the "sz" command is not installed by default – you need the download and compile the **lrzsz** library from <https://ohse.de/uwe/software/lrzsz.html>. Alternatively, you can install the package through Homebrew. **This is a much easier method.** Install homebrew, following the instructions on <http://brew.sh>, and run:  
brew install lrzsz

12. Wait for the Xinu image to upload. You should see a success message once complete. To boot into the Xinu kernel, enter the command:  
bootm

**NOTE:** The Xinu image now resides in the BBB's RAM. If the board is reset, the Xinu kernel can be re-launched by typing the "bootm" command in the U-Boot console. However, if power is removed from the board (when the USB cable is disconnected), the kernel will have to be re-uploaded.

## A. Windows Version

1. Follow the steps on <http://beagleboard.org/getting-started> up to **Step 2** to install the necessary BBB drivers. Be sure to restart afterwards.
2. Install the drivers for the USB-TTY cable. The site you ordered the cable from probably has a download link for these. If not, the ones on <https://www.adafruit.com/product/954> should work as well.
3. Plug in the TTY cable into the serial header. The serial header is the only set of "male" connectors on the board, and is labeled **J1**. Connect the **black** wire to **pin 1**, the **green** to **pin 4**, and the **white** to **pin 5**. Pin 1 can be identified by the small white dot next to it.

**IMPORTANT:** Do **not** connect the **red** wire anywhere on the BBB. Doing so may damage the board.

4. Identify the device name of the TTY cable. This will be a **COM** port; in the Windows device manager, and expand “Ports”. The name of the cable should be listed, along with its COM port.
5. Download the ARM version of Xinu from <http://www.xinu.cs.purdue.edu> and extract the files from the “tar.gz” archive (7zip is able to extract tar.gz).
6. Download ExtraPuTTY from <http://www.extraputty.com>. Normal PuTTY will not work because it does not support the serial protocol required to upload Xinu.
7. In ExtraPuTTY, select “Serial” as the connection type and enter the previously identified COM port with a speed of **115200**.
8. In the left-hand list, select **Connection > Serial** towards the bottom. Change **flow control** to **None (DTR/RTS disable)**. Click **Open**; you should see a command line window open.
9. Plug in the mini USB cable on the BBB, and immediately start pressing the **return** key in your terminal window. This will interrupt the BBB bootloader, allowing you to upload the Xinu image.
10. You should have a U-Boot prompt in your terminal window. Enter the command:  
loady
11. In the ExtraPuTTY menu, click **Transfer > Ymodem > Send**. Select the **xinu.boot** image from the **compile** directory in your extracted xinu source.
12. Wait for the Xinu image to upload. You should see a success message once complete. To boot into the Xinu kernel, enter the command:  
bootm

**NOTE:** The Xinu image now resides in the BBB’s RAM. If the board is reset, the Xinu kernel can be re-launched by typing the “bootm” command in the U-Boot console. However, if power is removed from the board (when the USB cable is disconnected), the kernel will have to be re-uploaded.