



Serial communications

Introduction

To communicate with the Uno32 we use serial communications (run over USB nowadays). To do this we need special software called a serial terminal that handles the low-level details of sending and receiving data.

Software

There is no cross-platform tool that works well for serial communications, so we have different tools depending on your platform:

- Windows - CoolTerm
- Linux – Cutecom, screen
- Mac OS X – CoolTerm, screen

Read the Tools Installation document on the website for details on how to install these on your platform. The lab computers already have the appropriate tools installed.

Communicating over serial

CoolTerm (Windows, OS X)

Determining your serial port name (Windows)

This is done by opening the start menu and searching for "devices", which will yield the "Devices and Printers" menu within the Control Panel. Open this. Under the Unspecified section you should see "FT232R USB UART" and double-click on it. Switching to the "Hardware" tab you will see a line like "USB Serial Port (COM4)", this will tell you what COM port the Uno32 is connected over. Remember this number and all the Properties window and the Devices and Printers window.

Determining your serial port name (OS X)

Available serial ports on OS X computer are listed as tty devices under the `/dev/` folder. To see which are available on your system open Terminal.app and run the following command:

```
ls /dev/tty*
```

In the resultant list, you should see some at the end like /dev/ttyUSB0, those will be what you want to connect to. There should be only one, so just use that, otherwise you'll need to experiment to find the right one.

Connecting to the Uno32

On the toolbar at the top select the gear and wrench Options icon. The top dropdown is where you will select the name of the serial device that you found in the previous section. Now set the "Baudrate" option to 9600, this is the speed we will be connecting at and click "OK". Now select the "Connect" option on the toolbar to start using that serial port.

Sending data

Transmitting data can be done in two ways. In the first way, you can just click in the large textbox and start typing, which will transmit data as you type it. You will need to set the newlines to use Unix line endings by selecting "Options" from the toolbar, then the "Terminal" settings, and setting the "Enter Key Emulation:" option to "LF". You will likely have to do this every time on the lab computers, but this setting should stick on your own computer.

The second way to transmit data is to use the "Send String" option in the "Connection" menu. This sends your data all in one go and will be useful for the BattleBoats lab during testing. To send the correct Unix line ending, you will need to set another setting under "Options" in the "Transmit" settings, enabling the "Terminate 'Send String' Data" option and setting the "Termination String" option to "0A".

Cutecom (Linux)

Cutecom is a reliable GUI interface to the serial ports on a Linux machine. Screen is available if you'd prefer a command line interface and discussed below.

Determining your serial port number

Available serial ports on a Linux computer are listed as tty devices under the "/dev/" folder. To see which are available on your system open a terminal emulator and run the following command:

```
ls /dev/tty*
```

In the resultant list, you should see some at the end like `/dev/ttyUSB0`, those will be what you want to connect to. There should be only one, so just use that, otherwise you'll need to experiment to find the right one.

Running Ccutecom

Now launch Ccutecom. You may need to be root in order to access the serial ports, so if the following directions don't work, try again using ``sudo``. To fix this issue, you'll need to search the Internet for help, as it varies between Linux distributions.

Connecting to the Uno32

In Ccutecom type the type in the full path to the serial port in the "Device" field, so in my case `"/dev/ttyUSB0"`. Set the "Baud rate" to 9600 and click "Open device".

Sending data

Sending data can be done by typing into the "Input" textfield at the bottom and hitting Enter. You will need to set the drop-down menu that says "No line end" to "LF line end" for the newline character to actually be transmitted. This setting should be remembered, however, so you should only need to do it once.

screen (Linux, OS X)

screen is a command line interface to the serial port that's available on both Linux and OS X, usually by default.

Determining your serial port number

Available serial ports on a Linux computer are listed as tty devices under the `"/dev/"` folder. To see which are available on your system open a terminal emulator and run the following command:

```
ls /dev/tty*
```

In the resultant list, you should see some at the end like `/dev/ttyUSB0`, those will be what you want to connect to. There should be only one, so just use that, otherwise you'll need to experiment to find the right one.

Connecting to the Uno32

Open a terminal emulator (Terminal.app on a Mac or the Terminal application on your Linux computer) and run `'screen PATH_TO_PORT BAUDRATE'`, for example `'screen /dev/ttyUSB0 9600'`.

You may need to be root in order to access the serial ports, so if the following directions don't work, try again with administrator privileges ``sudo screen``. To use

screen without sudo, you'll need to modify what groups your user is in, generally you'll need to add yourself to the 'dialout' group. Search the Internet for help, as it varies between Linux distributions.

Sending data

Sending data can be done by typing into the terminal, where newlines can be send by hitting Enter.

Exiting screen

To disconnect a screen session press "CTRL-A k", so "CTRL-A" followed by a "k" to kill the connection.