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Rosserial and Arduino IDE

Setup





Arduino IDE



Configuring the Arduino IDE

- The Arduino and Arduino IDE are great tools for quickly and easily programming hardware.
- The `rosserial_arduino` package, allows the usage of ROS directly with the Arduino IDE.
- Rosserial provides a ROS communication protocol that works over your Arduino's UART.
- Rosserial, allows Arduino to be a ROS node which can directly publish and subscribe to ROS messages, publish TF transforms, and get the ROS system time.
- Arduino IDE can also be used to program the Hackerboard and other microcontrollers like the ESP32.

A screenshot of the Arduino IDE interface. The top toolbar shows icons for checking, compiling, uploading, and downloading. The file explorer on the left shows a 'Blink' sketch. The main editor area displays the following C++ code:

```
// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(LED_BUILTIN, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)
  delay(1000); // wait for a second
  digitalWrite(LED_BUILTIN, LOW); // turn the LED off by making the voltage LOW
  delay(1000); // wait for a second
}
```

Arduino IDE



Arduino IDE



Installation

- Download the Arduino IDE from the [website](#).
- Install the Arduino IDE application into a folder on the desktop (Windows), or home folder (Ubuntu).
- Follow the installation instructions for Windows and Linux [here](#).
- Once installed, launch the application if you want to select your sketchbook location (File>>Preferences>>Sketchbook location).
 - Sketchbook is a standard place to store your programs, or sketches.
- Close the IDE when done.

Note: The Arduino IDE can be installed in the Virtual Machine, following the same steps.

The image shows two screenshots related to the Arduino IDE installation. The top screenshot is the Arduino IDE 2.0.3 download page. It features the Arduino logo and the text "Arduino IDE 2.0.3". Below this, it states: "The new major release of the Arduino IDE is faster and even more powerful! In addition to a more modern editor and a more responsive interface it features autocompletion, code navigation, and even a live debugger." It also mentions: "For more details, please refer to the [Arduino IDE 2.0 documentation](#)." and "Nightly builds with the latest bugfixes are available through the section below." There is a "SOURCE CODE" section stating: "The Arduino IDE 2.0 is open source and its source code is hosted on [GitHub](#)." To the right, under "DOWNLOAD OPTIONS", there are links for Windows (Win 10 and newer, 64 bits; MSI installer; ZIP file) and Linux (Applimage 64 bits (X86-64); ZIP file 64 bits (X86-64)). Below that are links for macOS (Intel, 10.14: "Mojave" or newer, 64 bits; Apple Silicon, 11: "Big Sur" or newer, 64 bits). An orange arrow points from the "DOWNLOAD OPTIONS" section to a set of symbols on the right. The bottom screenshot is the "Preferences" dialog box. It has tabs for "Settings" and "Network". The "Sketchbook location:" field is highlighted with an orange arrow and labeled "Sketchbook Location". The field contains the path "C:\Users\Mario\Documents\Arduino" and a "Browse" button. Other settings include "Editor language:" (System Default), "Editor font size:" (12), "Interface scale:" (Automatic, 100%), "Theme:" (Default theme), "Show verbose output during:" (compilation, upload), "Compiler warnings:" (None), and various checkboxes for "Display line numbers", "Verify code after upload", "Check for updates on startup", "Use accessibility features", "Enable Code Folding", "Use external editor", and "Save when verifying or uploading". At the bottom, there is a field for "Additional Boards Manager URLs:" with the path "/arduino-esp32/gh-pages/package_esp32_index.json" and a file icon.



Arduino IDE-ESP32 Setup



Arduino IDE – ESP32 and Hackerboard setup

- To install the ESP32 libraries follow the steps in any of the following links.
 - [Simple tutorial](#) (not official)
 - [Simple tutorial Arduino IDE 2.0](#) (not official)
 - [Espressif Tutorial](#) (official)
 - [Official Github](#)
- Connect the Hackerboard/ESP32 to the computer.
- Test the installation using the example (at the end) [here](#) or [here](#).



Install the ROS Libraries for Arduino (If needed)



- To setup the Arduino IDE follow the steps [here](#). In the section Installing the software. This setup is for ubuntu systems only or VM.

```
sudo apt-get install ros-${ROS_DISTRO}-roserial-Arduino  
sudo apt-get install ros-${ROS_DISTRO}-roserial
```

- Where ROS_DISTRO can be obtained running the following command on the terminal.

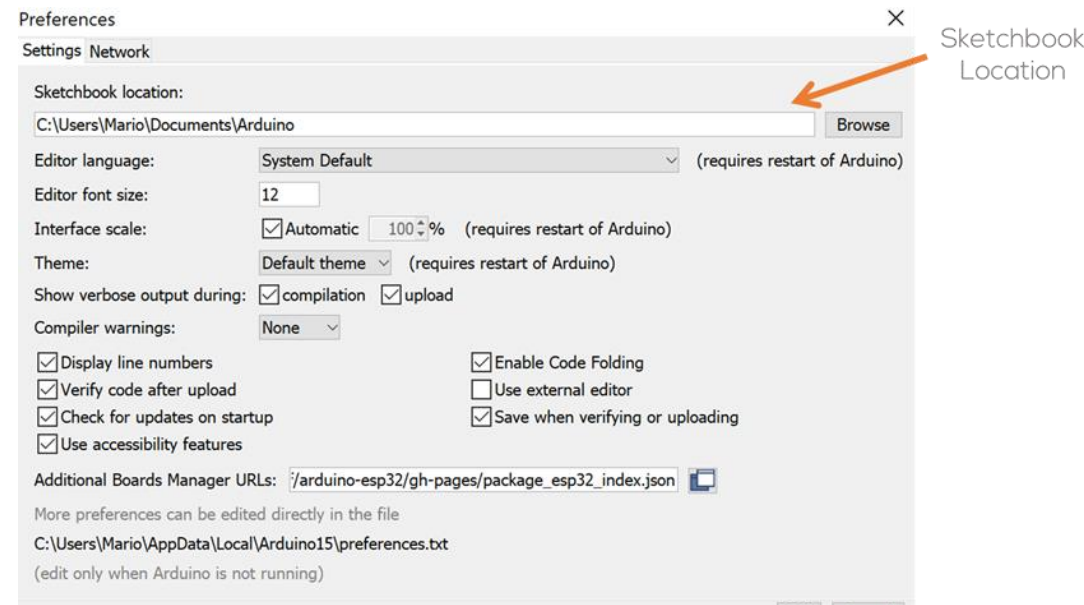
```
rosversion -d
```

- Go to the sketchbook folder (previous slide) and right click to open in terminal.

```
cd <sketchbook>/libraries  
rm -rf ros_lib  
roslaunch roserial_arduino make_libraries.py .
```

- If you are building Arduino on Windows, copy the ros_lib directory from Linux to the Windows system's sketchbook/libraries folder (typically found in My Documents).

*Note: Currently you can install the Arduino libraries directly in the Arduino IDE. Just open the Library Manager from the IDE menu in Sketch -> Include Library -> Manage Library. Then search for "roserial". This is useful if you need to work on an Arduino sketch but don't want to setup a full ROS workstation.





Port Permissions (Ubuntu)



- To use Arduino or the ESP32 in Ubuntu, the user must give permissions to the system for accessing ports.
- Make sure the port permissions are granted for the user.
 - In a new terminal type `cd ~/dev` to visualise the port designated by Ubuntu to the MCU. This port are usually called `/ttyACM0` or `/ttyUSB0`.
 - Having obtained the name of the port type the correspondent command to enable the permissions (replace the asterisk with the port number).

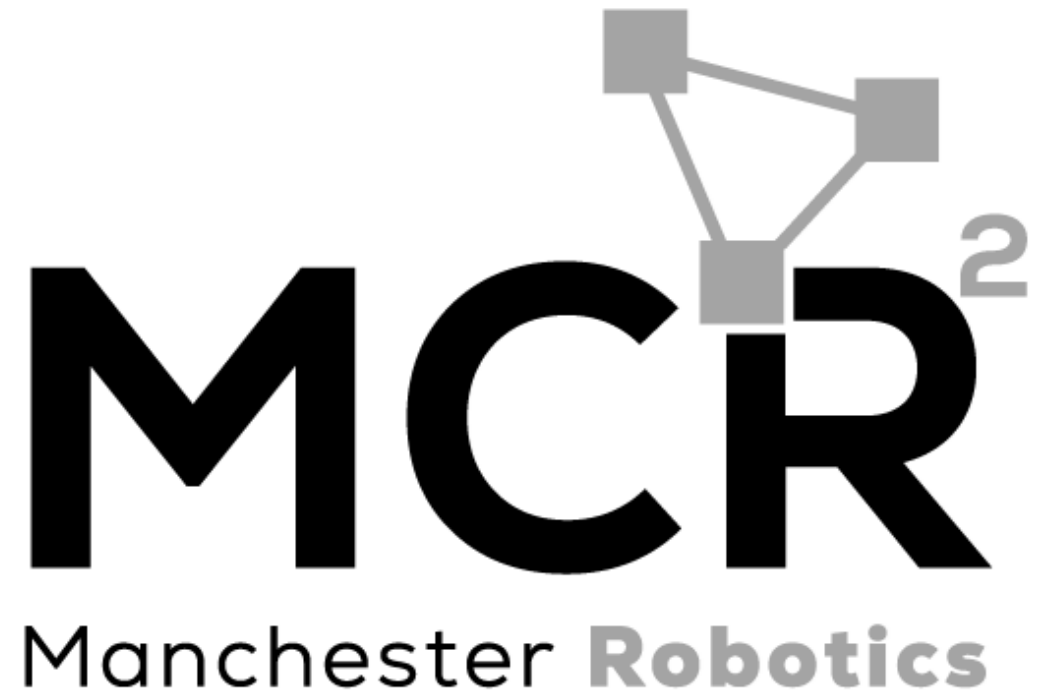
```
sudo chmod 666 /dev/ttyACM*  
sudo chmod 666 /dev/ttyUSB*
```

- To make the change permanently, follow the steps [here](#).

Troubleshoot

*Common problems with
Arduino IDE*

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USB Ports in VM



- When connecting a USB to a VM several steps must be performed for the virtual machine to be able to recognise the USB Port from the host computer. More information can be found [here](#).
- Make sure the correct drivers for the device are installed in the host computer. More information can be found [here](#).
- Give permissions to the VM to access the USB ports of the host machine. More information can be found [here](#) and [here](#).

A video tutorial on how to connect USB devices to the VMWare Player can be found [here](#).



Troubleshoot



Troubleshooting

- When compiling for the ESP32 the following error appears

“Missing Python: “python”: executable file not found in \$PATH”

To avoid this error, you can install the python-is-python3 package to create the symbolic links.

```
sudo apt install python-is-python3
```

- When compiling the following error appears

“ImportError: No module named serial”

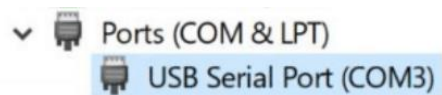
To avoid this error, install the pyserial library

```
sudo apt install python3-pip  
pip3 install pyserial
```

Additional Troubleshoot can be found [here](#), [here](#) and [here](#).

Troubleshoot (Drivers)

- Drivers are usually installed automatically by Windows and Ubuntu even for the Virtual Machines.
- How do I know if the drivers are properly installed (Windows)?
 - Plug the Puzzle-Bot into the USB port.
 - Go to Start > Device Manager
 - The Serial port should appear as shown in the following figure (The COM port may vary).



- If the computer cannot find the drivers, download the drivers from the following link
<https://ftdichip.com/drivers/vcp-drivers/>
- Verify that the USB cable is a data cable and not only a power cable!

- Scroll down and download the executable setup as shown in the following figure

Operating System	Release Date	X86 (32-Bit)	X64 (64-Bit)	PPC	ARM	MIPSII	MIPSIV	SH4	Comments
Windows*	2021-07-15	2.12.36.4	2.12.36.4	-	-	-	-	-	WHQL Certified. Includes VCP and D2XX. Available as a setup executable  Please read the Release Notes and Installation Guides .
Linux	-	-	1.5.0	-	-	-	-	-	All FTDI devices now supported in Ubuntu 11.10, kernel 3.0.0-19. Refer to TN-101 if you need a custom VCP VID/PID in Linux. VCP drivers are integrated into the kernel .
Mac OS X 10.3 to 10.8	2012-08-10	2.2.18	2.2.18	2.2.18	-	-	-	-	Refer to TN-105 if you need a custom VCP VID/PID in MAC OS
Mac OS X 10.9 to 10.14	2019-12-24	-	2.4.4	-	-	-	-	-	This driver is signed by Apple

Before Installing the drivers!!

- Unplug the Puzzle-Bot from the computer.
- Unzip the drivers and run the setup (some computers are required to be restarted after the installation).
- Plug the Puzzle-Bot back into the computer.



Troubleshoot



Troubleshoot (Drivers)

- Some Hackerboards have a different USB-UART chip the CP210x.
- Drivers are usually installed automatically by Windows and Ubuntu even for the Virtual Machines.
- Verify if they are installed by following the steps in the previous slide.
- Verify that the USB cable is a data cable and not only a power cable!.
- If the computer cannot find the drivers, download the drivers from the following link

<https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers?tab=downloads>

Before Installing the drivers!!

- Unplug the Puzzle-Bot from the computer.
- Unzip the drivers and run the setup (some computers are required to be restarted after the installation).
- Plug the Puzzle-Bot back into the computer.

A troubleshoot guide can be found [here](#).





Troubleshoot



Troubleshoot (Drivers)

- My computer still not recognize the drivers even after the installation
- Plug the Puzzle-Bot into the USB port.
- Go to Start > Device Manager.
- Look for the USB Serial Converter as shown in the following picture.

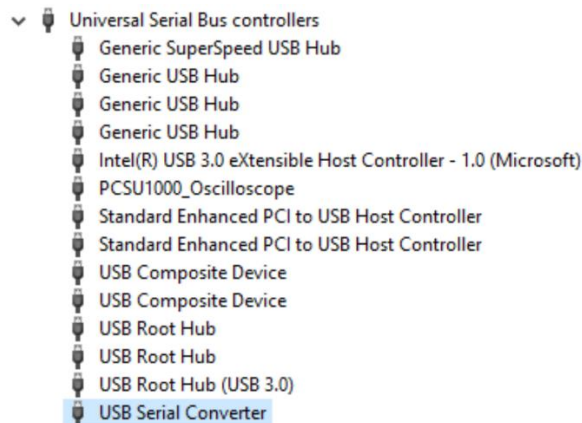


FIGURE: USB SERIAL CONVERTER

- Right Click to Properties > Advanced Tab.
- Make sure the Load VCP box is checked.
- Reconnect the Puzzle-Bot to the computer.

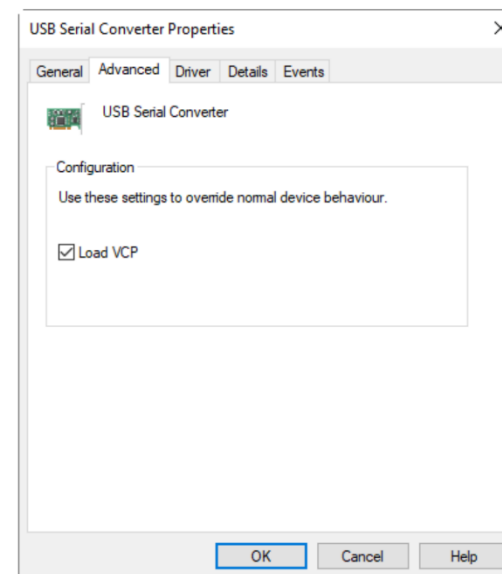


FIGURE: VCP PORT



Troubleshoot



Rosserial: Mismatched Protocol Error

- When using roserial with Arduino, the ESP32 or the Hackerboard in Ubuntu, if the following error message appears:

Mismatched protocol version in packet (b'\xbd'): lost sync or roserial_python is from different ros release than the roserial client

Please note that the error message may be slightly different.

- Go to your sketchbook (Arduino) Folder, in ubuntu or windows.
 - In ubuntu, is usually located in "home". The folder address can be seen in File>Preferences>Sketchbook Location.
 - In Windows, is usually located in "/Documents/Arduino/". The folder address can be seen in File>Preferences>Sketchbook Location.

- Open the file ros.h in the Arduino/Sketchbook folder:

~/Arduino/libraries/ros_lib/ros.h

~\Documents\Arduino\libraries\Rosserial_Arduino_Library\src\ros.h

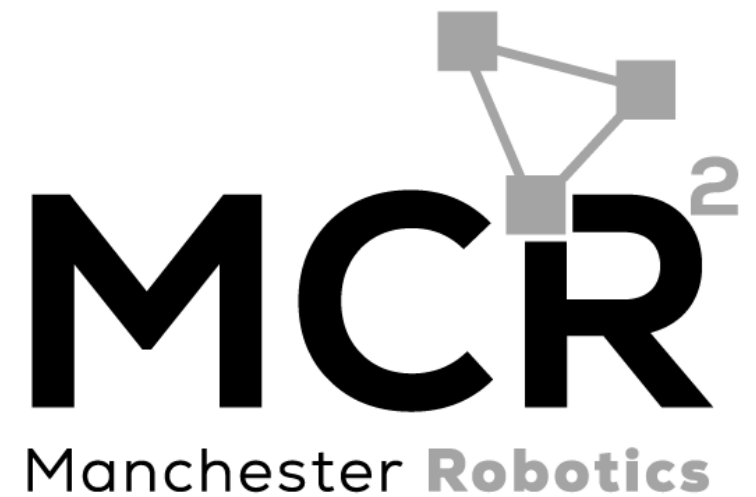
- Modify line 40 as follows:

```
40 // #if defined(ESP8266) or defined(ESP32) or defined(ROSSERIAL_ARDUINO_TCP)
41 #if defined(ROSSERIAL_ARDUINO_TCP)
42   #include "ArduinoTcpHardware.h"
43 #else
44   #include "ArduinoHardware.h"
45 #endif
```

- Save the file
- Restart the Arduino IDE
- Recompile and Upload the code to the Hackerboard/ESP32
- Test the solution by connecting to the board and uploading an example using a roserial example ([here](#)).

Thank you

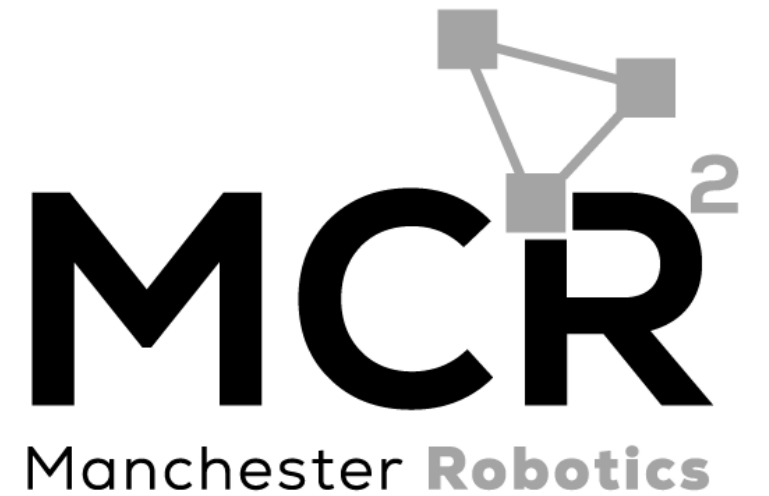
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